OPERATING AND MAINTENANCE INSTRUCTIONS RECEIVER TYPE 3010-C

ITT Mackay Marine
A DIVISION OF
INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

133 TERMINAL AVE. CLARK N. J. U.S.A.

ITT Mackay Marine

A DIVISION OF
INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

OPERATING AND MAINTENANCE INSTRUCTIONS RECEIVER TYPE 3010-C

133 TERMINAL AVENUE
CLARK, NEW JERSEY 07066

ONE HUDSON STREET
NEW YORK CITY, N. Y. 10013

350 MISSION STREET
SAN FRANCISCO, CALIF. 94105

M-8285-1

April 1968

ITT

ITT MACKAY MARINE SERVICE DEPOTS

BALTIMORE BEAUMONT BOSTON CORPUS CHRISTI, TEX. GALVESTON HONOLULU HOUSTON JACKSONVILLE LOS ANGELES
MANILA MIAMI MOBILE NEW ORLEANS NEW YORK NORFOLK PHILADELPHIA PORT ARTHUR
PORTLAND, ME. PORTLAND, ORE. SAN FRANCISCO SAN JUAN SAVANNAH SEATTLE TAMPA

WARRANTY

ITT Mackay Marine warrants all parts of this equipment, except vacuum tubes, to be free from defects caused by faulty materials or poor workmanship. Its liability under said warranty is limited to the obligation to repair, or at ITT Mackay Marine's option, to replace (without charge and return F. O. B. ITT Mackay Marine's plant), any such parts found to be defective under normal use and service within one year from date of shipment to ultimate user, or eighteen months from date of ITT Mackay Marine's shipment, whichever period expires first, provided that:

(a) ITT Mackay Marine is promptly notified in writing, upon discovery of such defects.

(b) Original parts be returned to ITT Mackay Marine, transportation charges prepaid.

(c) ITT Mackay Marine's examination shall disclose, to its satisfaction, that such defects have not been caused by abuse after delivery.

ITT Mackay Marine's apparatus or parts thereof which shall have been repaired or altered outside its plant, except by ITT Mackay Marine's authorized service agencies are not warranted in any respect. The foregoing are the only warranties, expressed or implied, made by ITT Mackay Marine.

ADDENDUM

RECEIVER TYPE 3010
INSTRUCTION MANUAL

On Schematic Diagram M-7500-15H, please change:

a. CR-8, CR-9, CR-10, and CR-11 to HC500F.

b. R-100 to 47 K.

ADDENDUM

3010-B RECEIVER INSTRUCTION MANUAL

A compensating capacitor has been added to the 3010-B Receiver to improve the frequency stability vs. temperature . The modified unit is designated Type 3010-C.

The following additions are necessary in the 3010-B Instruction Manual:

1. Page 4.5: C157; stock no. 281-157; Capacitor, tubular, temperature compensating, 5 pf ±.5 pf, N750, 600 VDCW; Centralab TCN-5.

2. Schematic Diagram M-7500-15H: C157, 5 pf, in parallel with C119.

All other 3010-B information in this instruction manual will apply to Type 3010-C.

ITT Mackay Marine
A DIVISION OF INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION
133 Terminal Ave., Clark, New Jersey 07066 Tel. (201) 381-2828

27 January 1969
M-2126

Mr. Richard Yoder
23755 Cunningham
Warren, Michigan, 48091

Dear Mr. Yoder:

ITT MACKAY MARINE 3010 RECEIVER

Thank you for your recent inquiry giving us this opportunity to familiarize you with ITT Mackay Marine Products.

We are pleased to enclose the descriptive literature you requested together with pricing information.

If at anytime you would like additional information covering our complete line of marine electronic products, please do not hesitate to contact us.

Very truly yours,

J. V. BRACH
Director of Marketing
Marine Products

encl.

ITT Mackay Marine

MARINE RADIO RECEIVER LF/IF/HF TYPE 3010C (115 VAC)

DESCRIPTION	PRICE**
Mackay Marine Receiver Type 3010C, Frequency Range 70 kHz to 30 MHz, with cabinet, operating tubes, built-in speaker, 6 kHz crystal filter, 3.1 kHz and .5 kHz mechanical filters, MR-599-5 Antenna Protective Relay, and manual.	$1,985.00 each
Less cabinet (for MRU or rack mounting complete with speaker kit)	$1,910.00 each

Additional to the above:

1. Spare Parts per drawing M-7513-1 (attached)	$ 53.00 each
2. Rotary Converter (150 watt) for operation from 110 VDC	$ 140.00 each
3. Stepdown Transformer (125 VA) for operation from 220 VAC (50-60 cycles)	$ 11.00 each

Optional:

1. Additional Manuals	$ 10.00 each
2. External Speaker with Cabinet	$ 60.00 each
3. Additional Filters (available on special order only)	$ 89.00 each

Type	Bandwidth
F455J-15	1.5 kHz
F455J-21	2.1 kHz

4. Headphones with phone plug	$ 12.00 each
5. Export Packing	$ 23.00 each

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. **Plus any applicable taxes.

Order acceptance warranty, Appendix K, attached, will be considered part of this offer.

NOTE:

A) Delivery stock (subject to prior sales).

B) F.O.B. Clark, New Jersey, U.S.A.

C) Installation -- Time/Material/Expense basis

ALL SALES ARE SUBJECT TO MACKAY MARINE ORDER ACCEPTANCE CLAUSE

3010 RECEIVER
SPARE ELECTRICAL PARTS LIST
(100 %)

Quantity Packed	Stock No.	Description
5	353-51	Fuse, 1.5 A, 125 V, Slo-Blo, 31301.5
5	419-17	Lamp, 6-8V, clear, miniature bayonet base, GE #51
1	831-72	Electron Tube, type OB2
1	830-18	Electron Tube, type 6AU6
1	831-69	Electron Tube, type 6AV6
4	831-58	Electron Tube, type 6BA6
1	831-45	Electron Tube, type 6BE6
1	831-117	Electron Tube, type 6BF5
2	831-116	Electron Tube, type 6BL8
1	830-6	Electron Tube, type 6C4
1	831-118	Electron Tube, type 6EW6
1	831-56	Electron Tube, type 6U8
1	831-61	Electron Tube, type 12AT7
1	831-115	Electron Tube, type 6688
1	831-126	Electron Tube, type 7788
1		Spare Parts Box, Buffington #7

M-7513-1

ITT MACKAY MARINE

TERMS AND CONDITIONS OF PROPOSAL

APPENDIX "K"

ORDER ACCEPTANCE:

All prices quoted are exclusive of municipal, state and federal use, sales and excise taxes, if any, which taxes purchaser agrees to pay. All orders are subject to home office acceptance. All price quotations are firm for thirty (30) days only and apply only with respect to deliveries we agree to make within six (6) months from the date of order acceptance. With respect to all other deliveries, it is agreed that we may increase our prices over quoted prices up to a maximum of 3% per year. For each year thereafter from date of the order an additional 3% cumulative each year up to a period of five years. In the event that we decrease the prices prior to the shipping date, we will give buyer benefit of such decreased prices. No refund will be made for price decreases after the equipment has been shipped. Deliveries beyond five years will be subject to a separate negotiation. Terms of payment in presence of approved credit are net thirty (30) days from presentation of invoice. Acceptance of order is contingent upon customer giving us a written purchase order, the terms of which are in effect identical to the terms herein set forth. Any such order must specify a firm shipping schedule acceptable to us. We are not liable for delays or failure to deliver, install, inspect or service or maintain equipment or materials by reason of causes unforeseen or beyond our control. Cancellation of orders will not be accepted and order acceptance creates a binding contract which can be modified and cancelled only by mutual consent.

WARRANTY:

ITT Mackay Marine warrants all parts of this equipment except vacuum tubes, to be free from defects caused by faulty materials or poor workmanship, but its liability under said warranty is limited to the obligation to repair, or at Mackay's option, to replace without charge and to return F.O.B. Mackay's plant, any such parts found to be defective under normal use and service within one year from date of shipment to ultimate user, or eighteen (18) months from date of Mackay's shipment, whichever period expires, first, provided:

(a) Mackay is promptly notified in writing upon discovery of such defects
(b) Original parts to be returned to Mackay, transportation charges prepaid and,
(c) Mackay's examination shall disclose to its satisfaction that such defects have not been caused by abuse after delivery. Mackay's apparatus or parts thereof which shall have been repaired, or altered outside its plant, except by Mackay's authorized service agencies, are not warranted in any respect.

The foregoing are the only warranties, express or implied, made by ITT Mackay Marine.

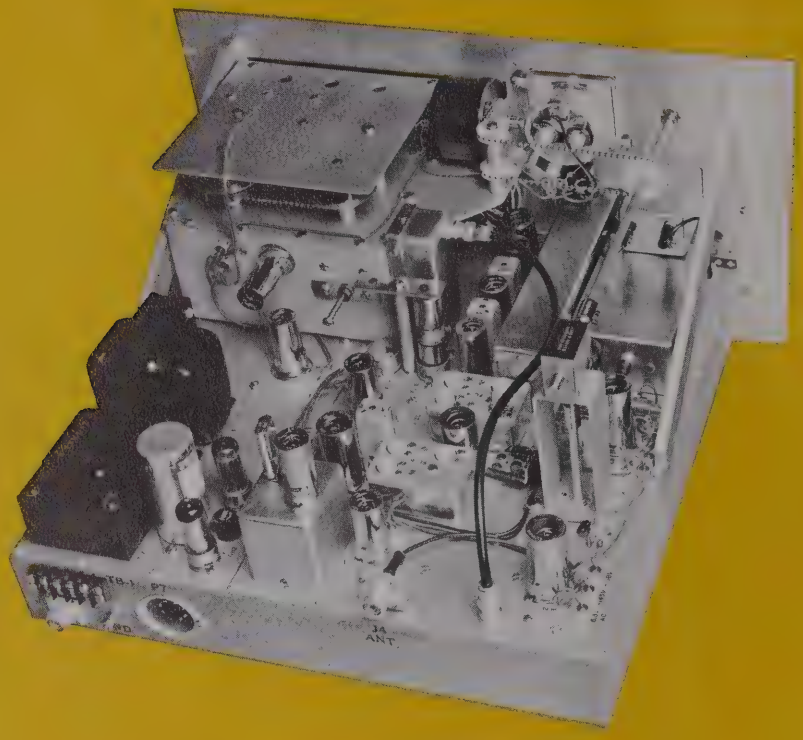
FORCE MAJEURE:

It is understood that the obligations of ITT Mackay Marine hereunder are subject to Force Majeure, including any delay which may be due to Government Priorities, intervention of Government Authorities, Acts of God, interruptions by reason of war or domestic disturbances, strikes, delay in obtaining any material or equipment ordered by ITT Mackay from third parties or other conditions beyond the control of ITT Mackay Marine, A Division of International Telephone and Telegraph Corporation.

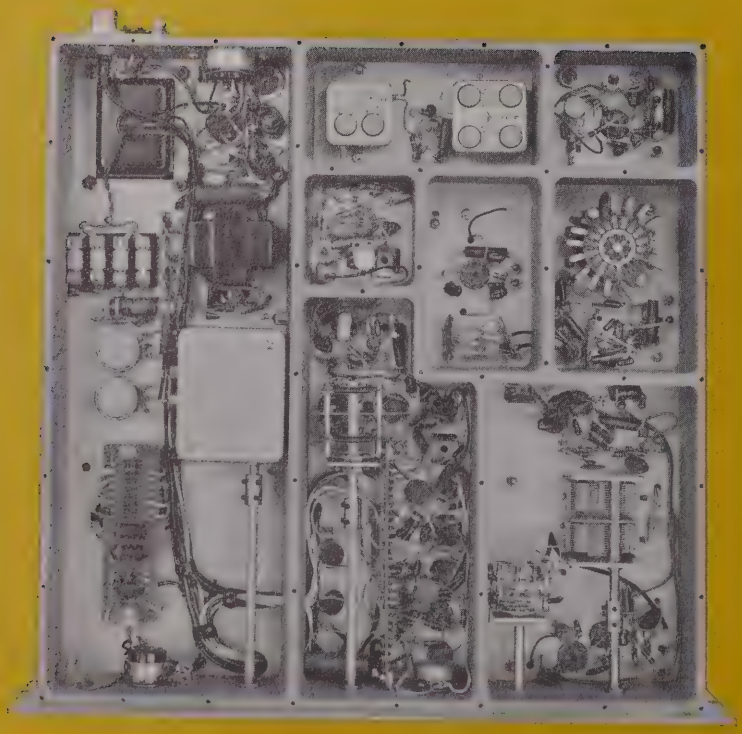
ITT Mackay Marine
Communications Receiver
Type 3010-C

Mackay Marine Division ITT

MACKAY MARINE RECEIVER 3010-C



TOP VIEW OF CHASSIS



UNDERSIDE VIEW OF CHASSIS

BROAD FREQUENCY COVERAGE HIGHLY STABLE COMMUNICATIONS RECEIVER

FEATURES

* Broad frequency coverage from 10 KHZ to 30 MHZ
* High order of stability equivalent to crystal control
* Dial calibrated directly in frequency over entire spectrum in 2000 HZ increments
* Rugged construction on cast aluminum chassis
* Self-contained highly stable crystal calibrator
* Three degrees of selectivity employing both crystal and mechanical filters
* No complicated gear trains, cams, and multi-deck band switches resulting in simple service procedures

DESCRIPTION

The ITT Mackay Marine Communications Receiver 3010-C is a carefully engineered product whose development is based upon many years of experience in the marine communications field. Although designed primarily to meet the severe requirements of shipboard operation, the features embodied in the Type 3010-C Receiver make it well suited for use in any application requiring a high quality general purpose communications receiver.

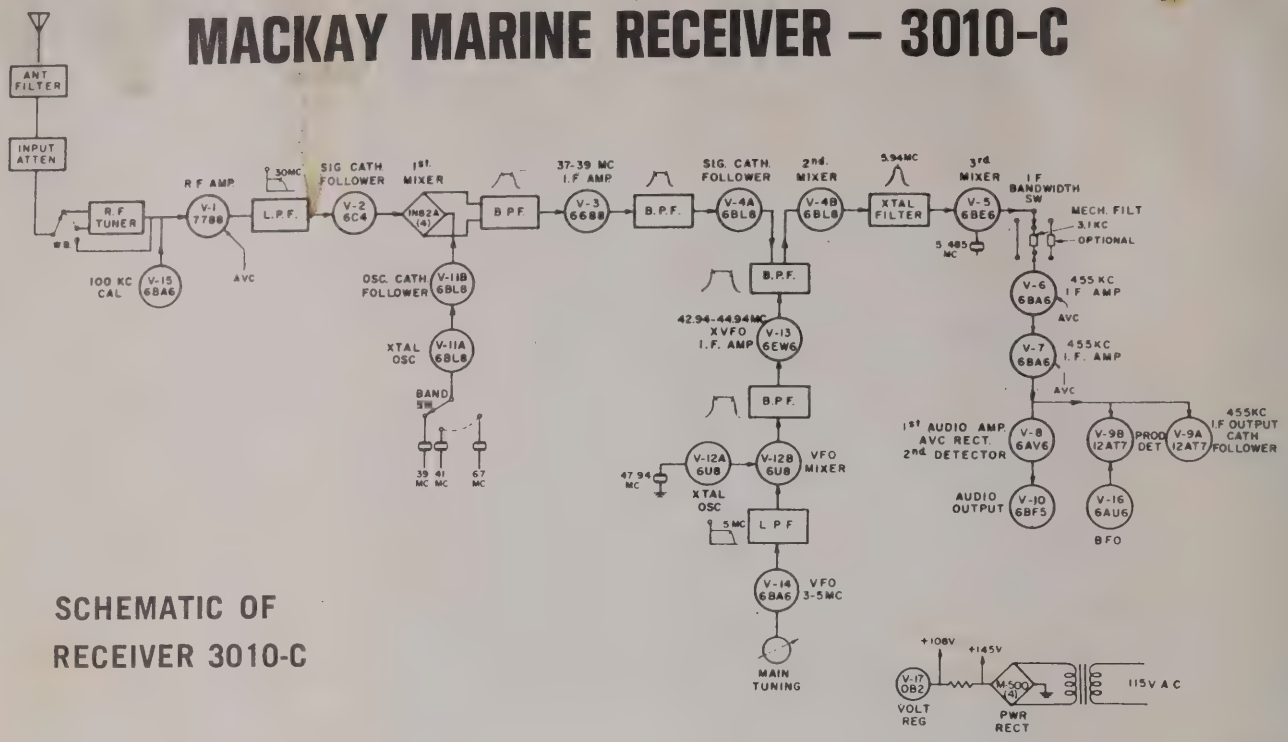
A heavy wall cast aluminum chassis provides extreme mechanical rigidity. This feature together with crystal controlled oscillators and a VFO whose variable capacitor is constructed with Invar plates results in a high degree of electrical stability despite temperature and humidity variations and in the presence of mechanical vibration.

The dial calibrations indicating the frequency directly in MHZ and KHZ are printed on a 7½ foot length of rugged fiber glass tape with major characters approximately one quarter of an inch in height. The 15 bands make the effective dial length over 100 feet with 2 KHZ increments separated by about 1/10 inch. The long effective length and large characters make the dial easy to read even at a distance of several feet.

The RF stage comprising a very high transconductance pentode can either be separately tuned or operated as a wide band amplifier. This method of tuning completely eliminates any complicated gear trains and cam mechanism and greatly facilitates service.

Provision is made for replacing the receiver VFO signal with a signal from an external source. This arrangement offers many possibilities for special operation, such as pushbutton control of certain often used frequencies, remote tuning, panoramic sweeping, etc.

MACKAY MARINE RECEIVER – 3010-C



SCHEMATIC OF
RECEIVER 3010-C

SPECIFICATIONS

Frequency Range 70 KHZ to 30 MHZ (and down to approximately 10 KHZ at reduced sensitivity)

Frequency Coverage 15 two-megahertz bands

Dial 90-inch film scale for each 2 MHZ band with calibration marks every 2 KHZ

Type of Reception AM, CW, MCW, SSB, FSK

Type of Circuit Triple conversion superheterodyne

Sensitivity

	A2*	AI	Frequency	Dummy Ant.	I.F.B.W.
(Max. uv for	6.0	3.0	70 KHZ-700 KHZ	IRE	3.1 KHZ
0.5 watts	1.5	1.5	700 KHZ- 4 MHZ	IRE	6 KHZ
output with	1.0	1.0	4 MHZ- 30 MHZ	75 ohms	6 KHZ
6 db (S + N)/N)	*400 HZ, 30% modulation MHZ				

Selectivity

IF Bandwidth Switch	6 db Bandwidth
Broad	6 KHZ
Medium	3.1 KHZ, mechanical filter, supplied
Narrow	Dependent upon mechanical filter selected (optional)

Images All images down 80 db or more

Automatic Gain Control Audio output rises less than 8 db for input range 10 uv to 10,000 uv. Fast attack permits use with CW and SSB signals.

Audio Output 1 watt into either 4 or 600 ohms at less than 10% total harmonic distortion, and 1 mw into 600 ohms

Overall Audio Frequency Response Within 6 db 300 HZ to 2500 HZ, 6 KHZ I.F.B.W.

IF Output 100 mv into 75 ohms at 455 KHZ

Limiter Full wave audio peak limiter

Calibrator 100 KHZ crystal calibrator which may be zero beat with WWV provides check points every 100 KHZ throughout the entire frequency range

RF—Audio Meter RF scale calibrated from 0-80 db above AGC threshold
Audio scale calibrated from –10 to +6 dbm

Antenna Input Single ended, approximately 75 ohms. Tuned input 70 KHZ to 4 MHZ designed for antenna characteristics represented by IRE dummy antenna.

Input Attenuator Provides approximately 0-40 db attenuation in five steps

Input Power 95 watts at 115 V, 50-60 HZ

Panel Size 17-1/16" x 9-9/16", or available in standard 19" rack panel

Depth Behind Panel 16"

ITT MACKAY MARINE, 133 TERMINAL AVE., CLARK, NEW JERSEY

A DIVISION OF

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION

CONTENTS

Section			Page
I	GENERAL DESCRIPTION		
	1.1	Introduction	1.1
	1.2	Description	1.1
		a. Mechanical	1.1
		b. Electrical	1.1
	1.3	Vacuum Tubes	1.2
	1.4	Electrical Characteristics	1.3
II	OPERATING INSTRUCTIONS		
III	OPERATOR'S MAINTENANCE AND INSTALLATION		
	3.1	Operator's Maintenance	3.1
		a. Faulty Tubes	3.1
		b. Removal of V1	3.1
		c. Mesh Liners for V5, V14, and V16	3.1
	3.2	Internal Adjustments	3.1
		a. First Mixer Balance Adjustment	3.1
		b. BFO Band-Set Adjustment	3.2
		c. R-f Tuner Coils Adjustment	3.2
		d. R-f Meter Zero Adjustment	3.2
	3.3	Installations	3.2
		a. Cabinet Installation	3.2
		b. Installation Within Mackay Console Units	3.2
		c. Antenna	3.2
		d. Power Connections	3.3
IV	ELECTRICAL PARTS LISTS		
	List of Replaceable Electrical Parts, M-7501-1		4.1
	List of Spare Electrical Parts, M-7513-1		4.15
V	CIRCUIT DESCRIPTION AND SERVICE INSTRUCTIONS		
	5.1	Circuit Description	5.1
		a. R-f Amplifier	5.1
		(1) Antenna Filter, FL2	5.1
		(2) Input Attenuator	5.1
		(3) R-f Tuner	5.1
		b. Signal Cathode Follower	5.1
		c. First Mixer	5.2
		d. 37-39 Mc I-f Amplifier	5.2
		e. I-f Signal Cathode Follower	5.2
		f. Second Mixer	5.2

		Page
g.	Variable Frequency Oscillator (VFO)	5.3
h.	VFO Mixer and Crystal Oscillator	5.3
i.	Translated VFO (XVFO) I-f Amplifier	5.3
j.	Third Mixer	5.3
k.	455 Kc I-f Amplifiers	5.3
l.	First Audio Amplifier, AVC Rectifier, and Second Detector	5.4
m.	Product Detector	5.4
n.	Beat Frequency Oscillator (BFO)	5.4
o.	Audio Output Amplifier	5.4
p.	455 Kc I-f Output Cathode Follower	5.4
q.	Noise Limiter	5.5
r.	100 Kc Crystal Calibrator	5.5
s.	Power Supply	5.5
5.2	Service Instructions	5.5
a.	General	5.5
b.	R-f Meter Range Adjustment	5.5
c.	Audio Meter Calibration	5.6
d.	Tests for I-f Misalignment	5.6
	(1) Overall Wide Band I-f Alignment Test	5.6
	(2) Test for FL8 and FL9 Alignment	5.6
e.	Notes On Alignment Of FL4, FL5, FL8, and FL9	5.7
f.	FL4 Alignment	5.8
g.	FL5 Alignment	5.9
h.	37-39 Mc Overall Alignment	5.9
i.	FL9 Alignment	5.9
j.	FL8 Alignment (And Overall XVFO I-f Alignment)	5.11
k.	5.94 Mc and 455 Kc I-f Alignment	5.11
l.	VFO Alignment	5.12
	(1) Equipment Required	5.12
	(2) Preliminary Adjustment	5.12
	(3) VFO Calibration Adjustments	5.13

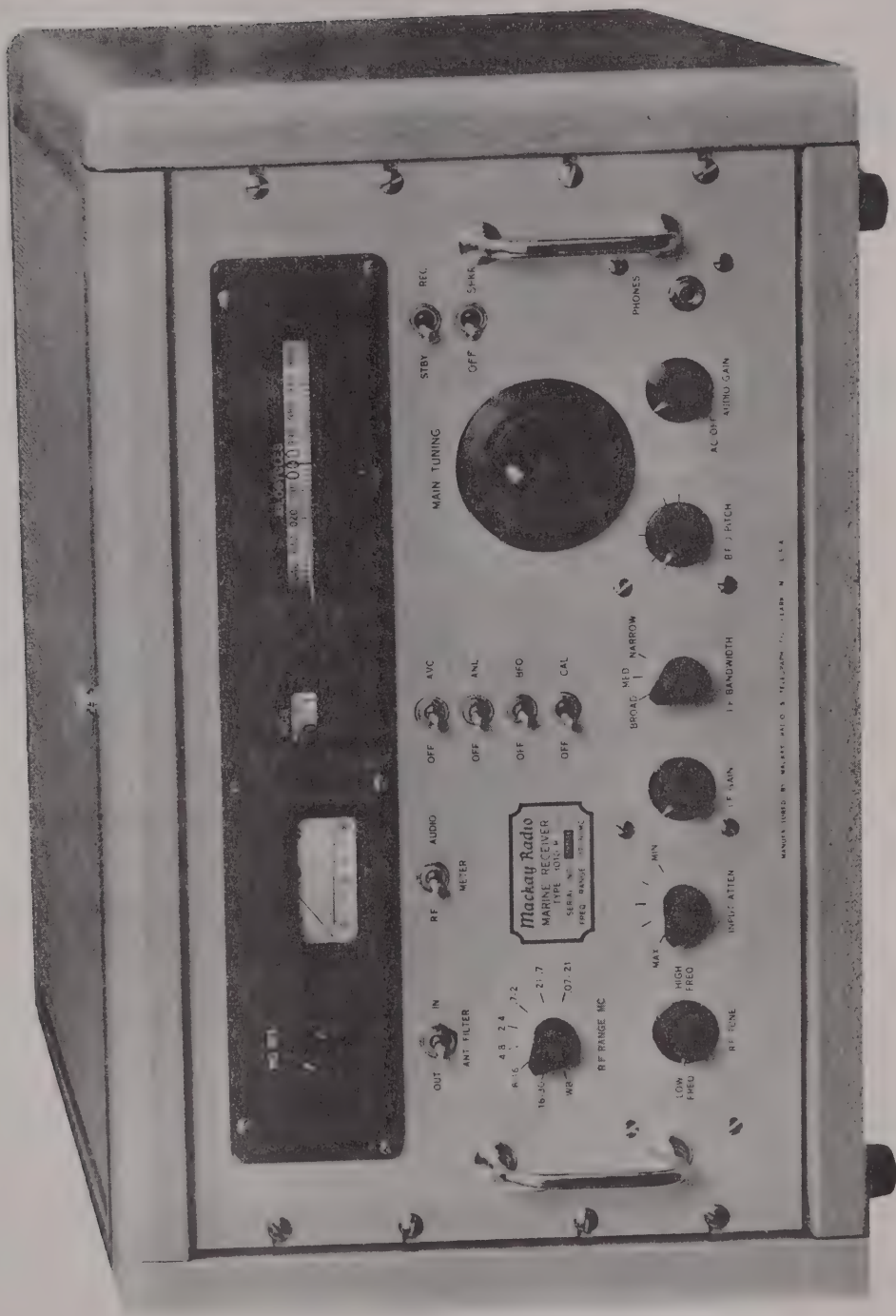
ILLUSTRATIONS

Receiver Type 3010, photograph	v
R-f Detector, Fig. 5.1	5.7
FL4 Response, Fig. 5.2	5.10
FL5 Response, Fig. 5.3	5.10
37-39 Mc I-f Overall Response, Fig. 5.4	5.10
FL9 Response, Fig. 5.5	5.10
Overall XVFO I-f Response, Fig. 5.6	5.10

DRAWINGS

Outline	M-7577-1
Block Diagram	M-7645-12
Tube Socket Voltages	M-7650-14
Schematic Diagram	M-7500-15 *

* Bound in envelope at rear of manual



Receiver Type 3010-B

SECTION I
GENERAL DESCRIPTION

1.1 INTRODUCTION

Mackay 3010 is a general purpose triple-conversion receiver designed for operation over the entire frequency range 70 kc to 30 mc, with operation extending down to approximately 10 kc at reduced sensitivity. Its high sensitivity, selectivity, stability, dial readability and resetability, and unusually rugged construction make it suitable for most applications requiring the reception of AM, CW, MCW, SSB, and FSK signals within its frequency range.

1.2 DESCRIPTION

a. Mechanical

The 3010 Receiver is provided as the main and high frequency receiver of the Mackay Marine Radio Units; and is also available cabinet mounted or with a standard 10-1/2 inch high, 19 inch wide panel for rack mounting. The exceptional mechanical rigidity results from a cast aluminum chassis onto which top and bottom plates are bolted. The top plate serves as the mounting surface for most of the tubes and components. Complete circuit shielding is provided by cast-in compartment partitions and the bottom plate.

The following controls are located on the front panel:

MC SEL
MAIN TUNING
RF RANGE MC
RF TUNE
INPUT ATTEN.
AUDIO GAIN, AC OFF
STBY.-REC.
IF GAIN
IF BANDWIDTH
BFO-OFF
BFO PITCH
ANL-OFF
AVC-OFF
CAL.-OFF
CURSOR
ANT. FILTER, OUT-IN
METER, RF-AUDIO
SPKR.-OFF
PHONES (Jack)

The antenna connector, 455 kc i-f output jack, 4 and 600 ohm audio output terminals, fuse, and a-c power receptacle are mounted on the rear of the chassis.

The MAIN TUNING knob drives the tuning capacitor directly which negates the possibility of backlash. A film dial, 90 inches long, accurately calibrated in 2 kc increments, is driven by the tuning capacitor through a toothed belt drive.

b. Electrical

The triple-conversion circuit, utilizing a unique heterodyning scheme, results in three important advantages over conventional receiver designs: first, the image rejection is in the order of 80 db throughout the entire frequency range; second, no tracked circuits are used, thereby eliminating complicated mechanical

ganging arrangements and costly tracking alignment procedures in the field; third, bandswitching is accomplished with a simple two-section switch rather than a complicated multi-deck band switch, thus reducing maintenance difficulties due to faulty switch contacts. Three degrees of i-f selectivity are provided, two of which utilize mechanical filters.

The frequency range, 70 kc to 30 mc, is divided into 15 two megacycle bands. Band change is effected with the MC SEL control which selects for each band the appropriate crystal in the h-f crystal oscillator. The desired signal, amplified by the r-f amplifier, together with the output from the h-f oscillator is fed to the first mixer comprising four diodes. Output from this balanced mixer is fed to the first i-f stage which is two megacycles wide and centered at 38 mc. This i-f output is converted in the second mixer to the second i-f frequency of 5.94 mc. Oscillator injection for the second mixer is derived from a highly stable variable frequency oscillator which tunes from 3 to 5 mc and is translated in the VFO mixer to 42.94 to 44.94 mc. Following amplification in the XVFO i-f amplifier, this signal is fed to the second mixer as the injection signal. The 5.94 mc output of the second mixer is translated to 455 kc in the third mixer. A crystal is used to determine the frequency of the third mixer oscillator injection.

Two detectors follow two stages of 455 kc i-f amplification. The first, a conventional diode detector, is utilized for the reception of signals which do not require a BFO for the recovery of intelligence; and the second, is a product detector with BFO signal injected into the cathode. Use of this product detector arrangement permits the use of AVC with CW or SSB signals since the BFO signal is applied after the AVC take-off point. The AVC is designed with a fast charge time constant.

A pair of silicon diodes are used for noise limiting and are effective in clipping undesired positive and negative noise pulses of short duration from the audio signal with a minimum of distortion to the desired signal. The clipper is followed by an audio voltage amplifier and then a power amplifier.

1.3 VACUUM TUBES

A list of tubes and their function is shown in the following table:

Circuit Ref. Symbol	Type	Function
V1	7788	R-f amplifier
V2	6C4	Signal cathode follower
V3	6688	37-39 mc i-f amplifier
V4	6BL8	Signal cathode follower and second mixer
V5	6BE6	Third mixer
V6	6BA6	455 kc i-f amplifier
V7	6BA6	455 kc i-f amplifier
V8	6AV6	First audio amplifier, AVC rectifier, and second detector
V9	12AT7	455 kc i-f output cathode follower and product detector

Circuit Ref. Symbol	Type	Function
V10	6BF5	Audio output
V11	6BL8	H-f oscillator and cathode follower
V12	6U8	VFO mixer and crystal oscillator
V13	6EW6	Translated VFO i-f amplifier
V14	6BA6	VFO
V15	6BA6	100 kc crystal calibrator
V16	6AU6	BFO
V17	OB2	Voltage regulator

1.4 ELECTRICAL CHARACTERISTICS

Frequency Range
70 kc to 30 mc, down to approximately 10 kc at reduced sensitivity

Frequency Coverage
15 two megacycle bands

Dial
90 inch film scale for each 2 mc band with calibration marks every 2 kc

Type of Reception
AM, CW, MCW, SSB, FSK

Type of Circuit
Triple conversion superheterodyne

Sensitivity
(Max. uv for 0.5 watts output with 6 db (S+N)/N)

A2*	A1	Frequency	Dummy Ant.	IF B.W.
6	3	70kc-700kc	IRE	3.1 kc
1.5	1.5	700kc-4mc	IRE	6 kc
1	1	4mc-30mc	75 ohms	6 kc

*400 cps, 30% modulation

Selectivity

I-f Bandwidth Switch	6 db Bandwidth
Broad	6 kc
Medium	3.1 kc, mechanical filter supplied
Narrow	Dependent upon mechanical filter selected (optional)

Images
All images down 80 db or more

Automatic Volume Control
Audio output rises less than 8 db for input range 10 uv to 10,000 uv. Fast attack permits use with CW and SSB signals.

Audio Output
1 watt into either 4 or 600 ohms at less than 10% total harmonic distortion, and one mw into 600 ohms

Overall Frequency Response
Within 6 db 300 cps to 2500 cps, 6 kc i-f BW

I-f Output
Approximately 100 mv into 75 ohms at 455 kc

Limiter
Symmetrical audio peak limiter

Calibrator
100 kc crystal calibrator which may be zero beat with WWV provides check points every 100 kc throughout the entire frequency range

R-f - Audio Meter	R-f scale calibrated from 0-80 db above AVC threshold. Audio scale calibrated from -10 to +6 dbm
Antenna Input	Single ended, approximately 75 ohms. Tuned input 70 kc to 4 mc designed for antenna characteristics represented by IRE dummy antenna
Input Attenuator	Provides approximately 0-40 db attenuation in five steps
Input Power	95 watts at 115 V, 50-60 cps

1.5 DIMENSIONS AND WEIGHT

Panel Size	17-1/16 inches wide by 9-9/16 inches high; (also available with a standard 19 inch rack panel 10-1/2 inches high)
Depth Behind Panel	16 inches
Weight	45 pounds

SECTION II
OPERATING INSTRUCTIONS

All controls required for the operation of the 3010 Receiver are mounted on the front panel. The function of each control is described below:

CONTROL	FUNCTION
MC SEL	Selects any one of the 15 bands. The selected band is indicated in the MCS window.
MAIN TUNING	Tunes the receiver to any frequency within each band. The precise frequency to which the receiver is tuned is read directly from the MCS dial number and the correspondingly colored KILOCYCLES number.
RF RANGE MC	Selects the frequency range over which the r-f amplifier grid circuit can be tuned with the RF TUNE control. When maximum sensitivity is not required, the r-f amplifier grid circuit need not be tuned and the WB (wide band) position of the RF RANGE switch is selected. The tuned circuit will provide rejection of strong unwanted signals that can cause cross modulation regardless of their frequencies. Care must be taken to avoid tuning the RF TUNE control to the interfering signal instead of the desired signal.
RF TUNE	Tunes the r-f amplifier grid circuit as described above. This control is inoperative when the WB position of the RF RANGE MC is selected.
INPUT ATTEN.	This control is used to reduce the level of all signals when strong unwanted signals are present which cannot be rejected sufficiently by resonating the r-f amplifier grid circuit. The input level can also be reduced if the required signal overloads the early stages of the receiver. The attenuator provides zero to approximately 40 db attenuation in five steps.
AUDIO GAIN, AC OFF	Located in the grid circuit of the first audio amplifier, this control varies the amount of a-f signal applied to grid of this tube, and thereby controls the amount of audio power output of the receiver. Ganged to this control is the a-c power switch. With the control in its extreme ccw position, power to all receiver circuits is removed.

CONTROL	FUNCTION
STBY.-REC.	In the STBY. position, receiver output is silenced by removing B+ from the 455 kc i-f amplifier, detector, and first audio amplifier stages. In the REC. position, the receiver is completely operative.
IF GAIN	This control varies the gain of the 455 kc i-f amplifier tubes by increasing or decreasing cathode bias. Overloading of the i-f strip may be recognized by an upscale deflection on the panel meter (as an RF indicator) with AVC OFF.
IF BANDWIDTH	Position — IF Bandwidth BROAD — Approximately 6 kc at 6 db down, and 20 kc at 60 db down. MED — Approximately 3.1 kc at 6 db down, and 6.5 kc at 60 db down. (Mechanical Filter) NARROW — Determined by mechanical filter supplied as an option with bandwidth specified by customer.
BFO OFF	This switch disconnects B+ from the BFO in the OFF position. In addition, output from either the diode detector or product detector is selected and fed to the first audio amplifier through the volume control. In the BFO OFF position, the diode detector is used. The BFO should be used for CW and SSB reception.
BFO PITCH	Varies the frequency of the BFO by about ±4 kc.
ANL OFF	Disconnects the diode noise clipper in the OFF position. The noise clipper is connected in the circuit when the ANL switch is set to the alternate position. When not required, the ANL should be OFF to reduce distortion.
AVC OFF	Connects the AVC bus to ground when the switch is OFF. The fast acting AVC may be used for all types of reception, but can be turned OFF when desired.
CAL OFF	This switch is a normally off momentary type. In the OFF position B+ is disconnected from the 100 kc crystal oscillator. An explanation of the use of the calibrator is given in the following paragraph.

ONTROL	FUNCTION
URSOR	The CURSOR moves the indicator line on the KILOCYCLES dial by approximately 20 kc in either direction for calibration purposes. The receiver may be calibrated against a station of known frequency, or the internal crystal calibrator. The calibrator emits a harmonic every 100 kc in the tuning spectrum and is used together with the CURSOR to calibrate very accurately any region of the dial as follows: Tune the MAIN TUNING knob to the integral multiple of 100 kc nearest the desired frequency. Turn the BFO on and set the BFO PITCH control with its pointer on the center panel mark. Hold the CAL. switch in the on position and zero beat the 100 kc marker. Then move the CURSOR until the hair line is set exactly on the desired 100 kc multiple. At higher frequencies the RF TUNE control should be tuned to the operating frequency when using the calibrator.
NT. FILTER, OUT-IN	The antenna band elimination filter supplied with the receiver attenuates the 0.6-1.6 mc band when the ANT. FILTER is set to the IN position. In the OUT position the band is unattenuated. This filter reduces interference and cross modulation from strong local signals. Filters for other bands can be provided.
ETER, RF-AUDIO	In the RF position the panel meter is connected as a relative signal strength indicator. It is calibrated in db above AVC threshold and is inoperative with AVC OFF. In the AUDIO position the meter is connected in the audio output circuit as a db meter.
PKR.-OFF	Disconnects 4 Ω audio output in the OFF position.
HONES jack	The PHONES jack is connected to the 600 ohm winding of the audio output transformer. Adequate volume level is provided to earphones having impedances from 600 ohms to 20,000 ohms.

SECTION III
OPERATOR'S MAINTENANCE AND INSTALLATION

3.1 OPERATOR'S MAINTENANCE

a. Faulty Tubes

In most cases receiver failure will be caused by faulty tubes. A list of tubes and their functions is given in Section 1.3.

b. Removal of V1

In order to remove V1 it is necessary to remove the antenna filter, FL2, which is fastened to the panel with the ANT. FILTER, OUT-IN switch nut.

c. Mesh Liners for V5, V14, and V16

These tubes have a metallic mesh liner which is slipped over them after the tubes are inserted into their sockets. The mesh should be slipped over the tube down to the shield base and the shield fitted over the liner and locked down in the usual manner.

3.2 INTERNAL ADJUSTMENTS

NOTE

> Except for the adjustments listed below, the operator should not attempt to set or peak any trimmer capacitors or i-f transformer slugs, particularly FL4, FL5, FL8, and FL9. These filters are broad-band networks and cannot be aligned without special test equipment and factory test procedure.

a. First Mixer Balance Adjustment

Occasional adjustment of first mixer balance may be required, particularly when V11 is replaced. If out of balance, several spurious signals will be heard in the 0 to 2 mc band. There are two balance adjustments provided: R22 and C402. C402 is located on FL4 and R22 is mounted on the chassis to the left of FL4. It is not necessary to remove the bottom plate for this adjustment.

With the INPUT ATTEN. at MAX., BFO on, and AVC OFF, tune the receiver to about 1960 kc. A spurious signal will be heard if the mixer balance is upset. Set the IF GAIN to minimum and the AUDIO GAIN to near maximum and adjust the balance controls alternately for minimum audio output.

b. BFO Band-Set Adjustment

Accurately tune the receiver to 1.0 mc using the crystal calibrator as the signal source and the r-f meter as indicator. Turn the BFO on and set the BFO control on the center panel marker (0). Turn the CAL. on and set the BFO band-set trimmer capacitor, C136, for zero beat. C136 is located at the front of the BFO housing.

c. R-f Tuner Coils Adjustment

R-f tuner coils, L1 through L6, are slug tuned coils, adjustable from the left side of the r-f tuner shield can. A fine screwdriver (shank diameter and blade width of approximately 3/32") should be used to adjust the slug settings. L7 is an air wound coil and will not require adjustment. L8 and L9 are not adjustable.

The slug tuned coils are adjusted at the low end of their respective ranges. Tune the receiver to the low frequency end of each r-f tuner range and adjust the appropriate slug for maximum receiver output with the RF TUNE control set to the LOW FREQ. panel mark. Adjustment can be made for noise peak, but a more accurate setting can be effected if a signal generator is used for a signal source.

d. R-f Meter Zero Adjustment

Potentiometer R104, RF METER ZERO ADJ., is used to adjust the zero signal meter reading in the RF setting of the METER switch. With the antenna disconnected, the INPUT ATTEN. at MAX., AVC on, and IF GAIN fully clockwise, adjust R104 until the pointer is at the dot to the left of 0 db. This control is on the right side of the chassis, to the rear of the VFO.

3.3 INSTALLATIONS

a. Cabinet Installation

Receiver Type 3010 for independent installation is provided with a steel cabinet for mounting on a shelf or table top. Refer to M-7577-1 for the outline dimensions of the receiver cabinet.

b. Installation Within Mackay Console Units

The 3010 Receiver is provided as a component of Mackay Radio and Telegraph Company Marine Radio Units MRU-14B, MRU-19B/20B, MRU-21/22, and MRU-23; and is housed within a compartment of the console. No cabinet is provided for such installations, and the receiver is mounted in the console at the factory.

c. Antenna

For operation over the entire frequency range with one antenna, a single wire antenna will provide satisfactory results. The length should be kept short,

consistent with the sensitivity required at the lowest frequency. The high sensitivity of the 3010 Receiver results in excellent performance with practically any antenna system; however, in applications requiring the most exacting overall system effectiveness, an antenna which matches an unbalanced 75 ohm line should be used. In the tuned positions of the RF RANGE MC switch above 4.0 mc, the input circuits of the receiver will provide an acceptable termination to a 75 ohm line. In the WB position the input impedance is high when INPUT ATTEN. is set to the MAX. position. With any other setting of the INPUT ATTEN. the input impedance is nominally 75 ohms. For tuned positions of the RF RANGE MC switch below 4.0 mc, the receiver will perform effectively with antennas whose characteristics are approximated by the standard IRE dummy antenna.

d. Power Connections

The input power to the 3010 Receiver is approximately 95 watts at 115 volts, 50-60 cps. Operation from d-c mains or a-c lines other than 115 volts is accomplished by means of a d-c to a-c converter or stepdown transformer of appropriate rating.

SECTION IV

REPLACEABLE ELECTRICAL PARTS LIST
FOR
3010-B RECEIVER
M-7501-1

Stock No.	Symbol	Description	Dwg./Cat. No.
274-237	C1 C61 C66	Capacitor, mica, 2 mmf, 500 VDCW, ±10%	Elmenco DM15-020K
282-78	C2	Capacitor, variable, 10-365 mmf per gang, 2 gangs	J.W. Miller 2112
274-262	C3 C18 C33 C109	Capacitor, mica, 220 mmf, 500 VDCW, ±10%	Elmenco DM15-221K
281-111	C4 C13 C15 C28 C31 C37 C38 C47 C52 C92 C99 C104 C107 C113 C114 C116 C117 C127 C128 C143 C147	Capacitor, feed-thru, 1000 mmf, 500 VDCW, ±10%, with nut and washer	Erie 327010 Z5F 102K
281-113A	C5 C8 C9 C14 C17 C20 C21	Capacitor, disc ceramic, .01 mf, ±10%, 500 VDCW	Erie 821-.01 ±10%, Z5P

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg./Cat. No.
281-113 (cont'd.)	C22		
	C25		
	C26		
	C39		
	C58		
	C59		
	C62		
	C63		
	C64		
	C65		
	C67		
	C69		
	C72		
	C78		
	C81		
	C82		
	C85		
	C86		
	C87		
	C90		
	C123		
	C124		
	C125		
	C126		
	C130		
	C132		
	C135		
	C144		
	C150		
	C151		
274-140	C6	Capacitor, mica, 10 mmf, 500 VDCW, ±5%	Elmenco DM15-100J
281-114	C7	Capacitor, disc ceramic, .001 mf, ±10%, 500 VDCW	Erie 831-.001 ±10%, Z5P
	C10		
	C12		
	C19		
	C23		
	C24		
	C34		
	C35		
	C40		
	C41		
	C42		
	C50		
	C56		
	C68		

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg./Cat. No.
281-114 (cont'd.)	C74 C76 C110 C111 C112 C115 C118		
281-115	C11 C60 C141 C142	Capacitor, disc ceramic, .1 mf, 75 VDCW	Gulton Ind. MIN-V-.1-Z
279-15	C16 C51 C94 C133 C134	Capacitor, paper, .1 mf, 200 VDCW	Aerovox P82Z
274-263	C27 C73 C84 C131	Capacitor, mica, 470 mmf, 300 VDCW, ±10%	Elmenco DM15-471K
274-264	C29 C30 C32 C93 C98 C100	Capacitor, mica, 750 mmf, 300 VDCW, ±10%	Elmenco DM15-751K
274-132	C36 C71 C75 C122	Capacitor, mica, 100 mmf, 500 VDCW, ±10%	Elmenco DM15-101K
	C43 C44 C45	Not Used	
274-267	C46	Capacitor, mica, 33 mmf, 500 VDCW, ±10%	Elmenco DM15-330K
274-268	C48	Capacitor, mica, 250 mmf, 500 VDCW, ±10%	Elmenco DM15-251K
274-269	C49 C53 C54 C57	Capacitor, mica, 120 mmf, 500 VDCW, ±5%	Elmenco DM15-121J

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg./Cat. No.
274-279	C55	Capacitor, mica, 18 mmf, 500 VDCW, ±5%	Elmenco DM15-180J
279-16	C70	Capacitor, paper, .05 mf, 200 VDCW	Aerovox P82Z
276-71	C77	Capacitor, electrolytic, 100 mf, 15 V	Sprague TE-1162
281-126	C79	Capacitor, disc ceramic, .0033 mf, ±20%, 500 VDCW	Centralab Type CF
274-251	C80	Capacitor, mica, 15 mmf, 500 VDCW, ±10%	Elmenco DM15-150K
276-35	C83 C89	Capacitor, electrolytic, 12 mf, 250 V	CDE BBR-12-250
276-72	C88	Capacitor, dual electrolytic, 100-150 mf/250-50 V	Sprague TVL-2509
274-130	C91	Capacitor, mica, 500 mmf, 300 VDCW, ±10%	Elmenco DM15-501K
274-270	C95	Capacitor, mica, 24 mmf, 500 VDCW, ±5%	Elmenco DM15-240J
274-271	C96 C145	Capacitor, mica, 240 mmf, 500 VDCW, ±5%	Elmenco DM15-241J
274-272	C97 C102	Capacitor, mica, 750 mmf, 300 VDCW, ±5%	Elmenco DM15-751J
274-145	C101 C103 C106	Capacitor, mica, 100 mmf, 500 VDCW, ±5%	Elmenco DM15-101J
274-146	C105	Capacitor, mica, 500 mmf, 300 VDCW, ±5%	Elmenco DM15-501J
273-20	C108	Capacitor, trimmer, 5-25 mmf, 500 VDCW	Erie 557000 C0P 039R
274-280	C119	Capacitor, mica, 47 mmf, 500 VDCW, ±2%	Elmenco DM15-470G
282-79	C120	Capacitor, variable, air, 20-220 mmf	M-7635-1
273-22	C121	Capacitor, trimmer, piston, 1-15 mmf	JFD Electronic VCJ803

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg./Cat. No.
282-39	C129	Capacitor, trimmer, air, 7-25 mmf	Hammarlund APC-25
282-22	C136	Capacitor, variable, 15 mmf	Hammarlund HF-15
273-19	C137	Capacitor, trimmer, 8-50 mmf, 500 VDCW	Erie 557000 U2P 034R
274-273	C138	Capacitor, mica, 270 mmf, 500 VDCW, ±5%	Elmenco DM15-271J
281-116	C139	Capacitor, tubular, 50 mmf, 600 VDCW, ±2%, N750 temp. char.	Centralab TCN-50
274-129	C140	Capacitor, mica, 330 mmf, 500 VDCW, ±10%	Elmenco DM15-331K
281-117	C146	Capacitor, disc ceramic, 0.05 mf, 250 VDCW	Gulton Ind. SMCB-.05-15
279-28	C148 C149	Capacitor, paper, 0.1 mf, 400 VDCW	Aerovox P82
274-259	C152	Capacitor, mica, 10 mmf, 500 VDCW, ±10%	Elmenco DM15-100K
274-255	C153 C154	Capacitor, mica, 62 mmf, 500 VDCW, ±10%	Elmenco DM15-620K
279-25	C155	Capacitor, paper, 0.25 mf, 200 VDCW	Aerovox P8292ZN11
**	C156	Capacitor, mica, 500 VDCW, ±10%,	Elmenco DM15-
308-29	CR1 CR2 CR3 CR4	Diode, germanium, 1N82A	Sylvania
569-26	CR5	Meter Rectifier, full bridge, copper oxide	Conant Labs A-80
569-25	CR6 CR7	Rectifier, silicon	Sarkes Tarzian F-6
569-16A	CR8 CR9 CR10 CR11	Rectifier, silicon	Solitron Devices HC500F
353-51	F1	Fuse, 1.5 A, 125 V, 3AG, Slo-Blo	Littlefuse 31301.5
	FL1	Not Used	

** Value to be determined during final test

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg. /Cat. No.
344-23	FL2 *	Filter, band elimination, 0.6-1.6 mc	M-7530-12
344-24	FL3	Filter, low pass, 0-30 mc	M-7528-2
344-25	FL4	Filter, IF, 37-39 mc	M-7520-2
344-26	FL5	Filter, IF, 37-39 mc	M-7509-12
344-33	FL6	Filter, mechanical, 3.1 kc	Collins F455J-31
	FL7 **	Filter, mechanical	Collins F455J-
344-29	FL8	Filter, XVFO, IF	M-7514-2
344-30	FL9	Filter, XVFO, IF	M-7516-2
344-31	FL10	Filter, VFO, low pass	M-7529-2
344-32	FL11	Filter, crystal, 5.94 mc	M-7624-1
419-17	I1 I2 I3 I4 I5	Lamp, 6-8 V, clear, miniature bayonet base	GE #51
408-8	J1 J2	Jack, phono	Switchcraft 3501FP
572-9	J3	Receptacle, BNC chassis, 1 hole mounting	Amphenol 31-102
572-16	J4	Receptacle with hood, with right angle adapter	Amphenol 83-1 w/83-765, 83-1
572-10	J5	Receptacle with hood	Amphenol 83-1 w/83-765
408-9	J6	Jack, telephone	Switchcraft L-1
736-21	J7	Socket, octal, with plug cap	Amphenol 78S8 w/3-24 plug ca
	J201 J202	Jack, phono	Part of FL2
	J1001	Receptacle, BNC chassis, 1 hole mtg.	Part of FL10
244-23	L1	Coil, RF Tuner, 0.07-0.21 mc range	M-7504-12-1
244-24	L2	Coil, RF Tuner, 0.21-0.7 mc range	M-7504-12-2

* Band elimination filters for other frequency ranges available on request.
** An accessory item supplied on request only.

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg./Cat. No.
244-25	L3	Coil, RF Tuner, .7-2 mc range	M-7504-12-3
244-26	L4	Coil, RF Tuner, 2-4 mc range	M-7504-12-4
244-27	L5	Coil, RF Tuner, 4-8 mc range	M-7504-12-5
244-28	L6	Coil, RF Tuner, 8-16 mc range	M-7504-12-6
244-29	L7	Coil, RF Tuner, 16-30 mc range	M-7504-12-7
227-43	L8	Choke, RF, 750 uh	National R-33
227-57	L9	Choke, RF, 5600 uh	Essex Elec. RFC-L-5600 uh
225-9	L10	Choke, Plate, RF Amplifier, 7 uh	M-7506-2
227-50	L11 L27	Choke, RF 10 uh	J.W. Miller 4612
227-42	L12	Coil, RF, 1 mh	National R-50
227-51	L13 L15 L16 L18 L24 L25 L29 L30 L31 L34 L35	Choke, RF, 10 uh	J.W. Miller 4622
227-52	L14	Choke, RF, 47 uh	J.W. Miller 70F475A1
	L17	Not Used	
227-26	L19 L38	Coil, RF, 100 uh	National R-33
244-32	L20	Coil, RF, 500-1000 uh	North Hills 120J
227-53	L21	Choke, RF, 1 mh	J.W. Miller 70F103A1
244-33	L22	Coil, 39-67 mc Oscillator	M-7524-1
244-34	L23	Coil, Plate, 39-67 mc Oscillator	M-7503-1
227-54	L26	Choke, RF, 22 uh	J.W. Miller 70F225A1

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg. /Cat. No.
227-55	L28	Choke, RF, 0.82 uh	J. W. Miller 4594
244-35	L32	Coil, RF, 100 uh	J. W. Miller 70F104A1
244-36	L33	Coil, BFO	M-7521-1
227-56	L36	Choke, RF, 470 uh	J. W. Miller 70F474A1
564-15	L37	Reactor, 8 h	SNC Mfg. Co. 2P147
387-27	L39 L40	Coil, variable, 36-64 uh	North Hills 120
463-4	M1	Meter	M-7522-1
545-9	P1 P2 P4 P5	Plug, phono	National Tel-Tronics 44CL
288-28	P3 P6	Plug, BNC cable connector for RG-59/U, crimp type	Amphenol 68-175
550-34	P7	Plug, octal, assembled in shell	Amphenol 86CP8 with 61-61 shell
550-37	P8	Plug	Amphenol 83-750
613-1A	R1 R78 R90 R94	Resistor, fixed, composition, 100 Ω, 1/2 watt, ±10%	Ohmite Little Devil
613-2	R2 R3 R4 R5 R6 R7 R8 R9 R35	Resistor, fixed, composition, 150 Ω, 1/2 watt, ±10%	Ohmite Little Devil

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg. /Cat. No.
641-4	R10 R64 R101 R110	Resistor, fixed, composition, 220 K, 1/2 watt, ±10%	Ohmite Little Devil
612-1	R11 R28 R34	Resistor, fixed, composition 10 Ω, 1/2 watt, ±10%	Ohmite Little Devil
618-1A	R12	Resistor, fixed, composition, 680 Ω, 2 watts, ±10%	Ohmite Little Devil
622-1B	R13 R15 R19 R30 R32 R47 R52 R83 R86 R111	Resistor, fixed, composition, 1 K, 1/2 watt, ±10%	Ohmite Little Devil
612-6	R14	Resistor, fixed, composition, 56 Ω, 1/2 watt, ±10%	Ohmite Little Devil
634-3	R16 R17 R18 R29 R37	Resistor, fixed, composition, 33 K, 1/2 watt, ±10%	Ohmite Little Devil
618-2	R20 R31 R76 R84	Resistor, fixed, composition, 680 Ω, 1/2 watt, ±10%	Ohmite Little Devil
615-5	R21 R23	Resistor, fixed, composition, 330 Ω, 1/2 watt, ±5%	Ohmite Little Devil
557-103	R22	Potentiometer, miniature, locking, linear taper, 250 Ω, 1/2 watt, ±10%	Ohmite Type AS #3602
612-26	R24	Resistor, fixed, composition, 68 Ω, 1/2 watt, ±10%	Ohmite Little Devil
616-2	R25 R112	Resistor, fixed, composition, 470 Ω, 1/2 watt, ±10%	Ohmite Little Devil

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg./Cat. No.
642-2	R26 R27 R33 R80 R88	Resistor, fixed, composition, 270 K, 1/2 watt, ±10%	Ohmite Little Devil
631-3A	R36 R39 R46 R51 R74 R91	Resistor, fixed, composition, 15 K, 1/2 watt, ±10%	Ohmite Little Devil
633-9	R38 R41 R79 R81	Resistor, fixed, composition, 22 K, 1/2 watt, ±10%	Ohmite Little Devil
623-4	R40 R82	Resistor, fixed, composition, 2.7 K, 1/2 watt, ±10%	Ohmite Little Devil
639-2	R42 R43 R49 R58 R63 R68 R116	Resistor, fixed, composition, 100 K, 1/2 watt, ±10%	Ohmite Little Devil
612-15	R44 R50 R87 R92	Resistor, fixed, composition, 75 Ω, 1/2 watt, ±5%	Ohmite Little Devil
557-104A	R45	Potentiometer, 25 K, 2 watt, ±10%, linear taper, with shaft 1-1/8" FMS, with mounting nut and lockwasher	Allen Bradley JA1N108P253U w/M-2786, M-2
637-2	R48	Resistor, fixed, composition, 68 K, 1/2 watt, ±10%	Ohmite Little Devil
625-4	R53 R75 R96 R99	Resistor, fixed, composition, 4.7 K, 1/2 watt, ±10%	Ohmite Little Devil
645-8	R54 R60	Resistor, fixed, composition, 2.7 meg Ω, 1/2 watt, ±10%	Ohmite Little Devil

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg. /Cat. No.
643-2	R55 R57 R72	Resistor, fixed, composition, 470 K, 1/2 watt, ±10%	Ohmite Little Devil
640-1	R56	Resistor, fixed, composition, 150 K, 1/2 watt, ±10%	Ohmite Little Devil
624-3	R59 R70	Resistor, fixed, composition, 3.3 K, 1/2 watt, ±10%	Ohmite Little Devil
643-7	R61 R98	Resistor, fixed, composition, 680 K, 1/2 watt, ±10%	Ohmite Little Devil
645-2	R62	Resistor, fixed, composition, 2.2 meg Ω, 1/2 watt, ±10%	Ohmite Little Devil
623-6	R65 R66 R93 R113	Resistor, fixed, composition, 2.2 K, 1/2 watt, ±10%	Ohmite Little Devil
627-3	R67	Resistor, fixed, composition, 6.8 K, 1/2 watt, ±10%	Ohmite Little Devil
636-2	R69 R97 R100 R109	Resistor, fixed, composition, 47 K, 1/2 watt, ±10%	Ohmite Little Devil
622-2A	R71	Resistor, fixed, composition, 1.5 K, 1/2 watt, ±10%	Ohmite Little Devil
613-4	R73	Resistor, fixed, composition, 150 Ω, 2 watt, ±10%	Ohmite Little Devil
632-4	R77	Resistor, fixed, composition, 18 K, 1/2 watt, ±10%	Ohmite Little Devil
631-4	R85	Resistor, fixed, composition, 10 K, 1/2 watt, ±10%	Ohmite Little Devil
612-29	R89	Resistor, fixed, composition, 15 Ω, 1/2 watt, ±10%	Ohmite Little Devil
640-5	R95	Resistor, fixed, composition, 180 K, 1/2 watt, ±10%	Ohmite Little Devil
557-79	R102	Potentiometer, 10 K, 2 watt, ±10% slotted shaft, locking bushing, linear taper	Ohmite CLU-1031
557-96	R103	Potentiometer, 500 Ω, 2 watt, ±10%, slotted shaft, locking bushing, linear taper	Ohmite CLU-5011

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg. / Cat. No.
557-106	R104	Potentiometer, 2.5 K, 2 watt, ±10% slotted shaft, locking bushing, linear taper	Ohmite CLU-2521
631-11	R105	Resistor, fixed, composition, 10 K, 1/2 watt, ±5%	Ohmite Little Devil
638-5	R106	Resistor, fixed, composition, 82 K, 1/2 watt, ±5%	Ohmite Little Devil
644-2B	R107	Resistor, fixed, composition, 1.5 meg Ω, 1/2 watt, ±10%	Ohmite Little Devil
557-105A	R108	Potentiometer, 500 K, 2 watt, ±10%, audio taper, with shaft 1-1/8" FMS, with SPST switch affixed, with mounting nut and lockwasher	Allen Bradley JS1N108P504AA w/M-2786, M-28
672-24	R114	Resistor, WW, 1 K, 5 watt	Ohmite Brown Devil
637-8	R115	Resistor, fixed, composition, 56 K, 1/2 watt, ±10%	Ohmite Little Devil
633-2	R117	Resistor, fixed, composition, 27 K, 1/2 watt, ±10%	Ohmite Little Devil
612-23	R118	Resistor, fixed, composition, 10 Ω, 2 watt, ±10%	Ohmite Little Devil
767-143	S1	Switch, Input Attenuator	M-7518-1
767-144	S2	Switch, RF Tuner Range	M-7517-1
767-145	S3	Switch, IF Bandwidth	M-7519-1
779-15	S4 S7 S8	Switch, Toggle, DPDT, 15/32" bushing length	Cutler Hammer 8363-K7
767-146	S5	Switch, Band Selector	M-7511-2
779-21	S6	Switch, Toggle, Momentary, SPST, 15/32" bushing length	Cutler Hammer 7583L-K8
779-22	S9	Switch, Toggle, SPST, 15/32" bushing length	Cutler Hammer 8280-K16
767-147A	S10	Switch	Part of R108

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg./Cat. No.
779-23	S11 S12	Switch, Toggle, SPDT, 15/32" bushing length	Cutler Hammer 7582-K6
	T1	Not Used	
811-10	T2	Transformer, IF, 455 kc	M-8308-1
811-8	T3	Transformer, IF, 455 kc	M-8307-1
806-19	T4	Transformer, Output	SNC Mfg. Co. 6P752
807-19	T5	Transformer, plate, 47.94 mc oscillator	M-7505-2
244-37	T6	VFO Oscillator Coil with 1 turn link	M-7527-2
809-43	T7	Transformer, power	M-7502-2
796-66	TB1	Terminal Strip	Cinch Jones 4-140Y
831-126	V1	Electron Tube, type 7788	Amperex
830-6	V2	Electron Tube, type 6C4	
831-115	V3	Electron Tube, type 6688	Amperex
831-116	V4 V11	Electron Tube, type 6BL8	
831-45	V5	Electron Tube, type 6BE6	
831-58	V6 V7 V14 V15	Electron Tube, type 6BA6	
831-69	V8	Electron Tube, type 6AV6	
831-61	V9	Electron Tube, type 12AT7	
831-117	V10	Electron Tube, type 6BF5	
831-56	V12	Electron Tube, type 6U8	

RECEIVER TYPE 3010-B (Cont'd.)

Stock No.	Symbol	Description	Dwg./Cat. No.
831-118	V13	Electron Tube, type 6EW6	
830-18	V16	Electron Tube, type 6AU6	
831-72	V17	Electron Tube, type OB2	
310-12	Y1	Crystal, quartz, 39 mc	M-7512-1
310-13	Y2	Crystal, quartz, 41 mc	M-7512-1
310-14	Y3	Crystal, quartz, 43 mc	M-7512-1
310-15	Y4	Crystal, quartz, 45 mc	M-7512-1
310-16	Y5	Crystal, quatz, 47 mc	M-7512-1
310-17	Y6	Crystal, quartz, 49 mc	M-7512-1
310-18	Y7	Crystal, quartz, 51 mc	M-7512-1
310-19	Y8	Crystal, quartz, 53 mc	M-7512-1
310-20	Y9	Crystal, quartz, 55 mc	M-7512-1
310-21	Y10	Crystal, quartz, 57 mc	M-7512-1
310-22	Y11	Crystal, quartz, 59 mc	M-7512-1
310-23	Y12	Crystal, quartz, 61 mc	M-7512-1
310-24	Y13	Crystal, quartz, 63 mc	M-7512-1
310-25	Y14	Crystal, quartz, 65 mc	M-7512-1
310-26	Y15	Crystal, quartz, 67 mc	M-7512-1
310-27	Y16	Crystal, quartz, 47.94 mc	M-7512-1
310-28	Y17	Crystal, quartz, 5.485 mc	M-7512-1
310-29	Y18	Crystal, quartz, 100 kc, with .050 pins	Peterson Radio Z-6A with .050 pins
244-38	Z1	Choke, RF, 39-67 mc	M-7525-1

3010 RECEIVER
SPARE ELECTRICAL PARTS LIST
(100 %)

Quantity Packed	Stock No.	Description
5	353-51	Fuse, 1.5 A, 125 V, Slo-Blo, 31301.5
5	419-17	Lamp, 6-8V, clear, miniature bayonet base, GE #51
1	831-72	Electron Tube, type OB2
1	830-18	Electron Tube, type 6AU6
1	831-69	Electron Tube, type 6AV6
4	831-58	Electron Tube, type 6BA6
1	831-45	Electron Tube, type 6BE6
1	831-117	Electron Tube, type 6BF5
2	831-116	Electron Tube, type 6BL8
1	830-6	Electron Tube, type 6C4
1	831-118	Electron Tube, type 6EW6
1	831-56	Electron Tube, type 6U8
1	831-61	Electron Tube, type 12AT7
1	831-115	Electron Tube, type 6688
1	831-126	Electron Tube, type 7788
1		Spare Parts Box, Buffington #7

M-7513-1

SECTION V
CIRCUIT DESCRIPTION AND SERVICE INSTRUCTIONS

5.1 CIRCUIT DESCRIPTION (See para. 1.2b.)

a. R-f Amplifier

V1, 7788, is a wide band r-f amplifier with a 30 mc cutoff low pass filter as plate load. The LPF provides approximately 80 db insertion loss at the first i-f frequency of 38 mc and attenuates incoming signals above 30 mc, and any distortion products generated in the r-f amplifier which might otherwise feed directly into the first i-f and appear in the receiver output as interfering signals. The antenna is connected to the input of the r-f amplifier through the following, all of which can be disabled with front panel controls:

(1) Antenna Filter, FL2

This filter is designed to attenuate signals in the 0.6 to 1.6 mc band by approximately 30 db in order to reduce cross modulation caused by strong broadcast signals in and near ports, coastwise, etc. Filters for other frequencies can be substituted for particular installations wherein it is required to reduce interference from a strong local transmitter(s). The filter as supplied with the receiver introduces negligible insertion loss (1 db, or so) at all frequencies outside the 0.6 to 1.6 mc band provided the antenna impedance is in the order of 75 ohms. Passband insertion loss increases as the antenna impedance increases.

(2) Input Attenuator

The incoming signal can be attenuated by between 0 and 40 db with a five step resistive attenuator. See page 2.1 for details.

(3) R-f Tuner

Receiver sensitivity is increased and front-end selectivity is provided when the r-f tuner is used. A single tuned circuit is resonated at the operating frequency with the RF TUNE control. The coils are tapped to terminate the antenna in approximately 75 ohms for frequencies above 4 mc, and to provide an approximate conjugate match to the IRE dummy antenna below 4 mc. See page 2.1 for details of operation.

b. Signal Cathode Follower

V2, 6C4, connected as a cathode follower, serves to isolate the first mixer from impedance changes in the r-f amplifier stage that would upset the first mixer balance and provides a low impedance source for the signal input to the first mixer.

c. First Mixer

Four v-h-f diodes, type 1N82A, are connected as a balanced mixer. The mixer balance adjustments (see para. 3.2a.) are set to cancel the 39 mc local oscillator signal in the output of the mixer when the receiver is operating in the 0 to 2 mc band. Several objectionably strong spurious signals will appear in the receiver output if these balance adjustments are incorrectly set.

Incoming signals are heterodyned to the first i-f passband of 37 to 39 mc in this mixer by selecting in its output the difference between the high frequency local oscillator signal and the incoming signal frequency. For example, with the 10 to 12 mc band selected the high frequency crystal oscillator frequency is 49 mc. If the input signal is 10 mc, the i-f signal will be 39 mc; and for an input of 12 mc, the i-f signal will be 37 mc.

d. 37-39 Mc I-f Amplifier

I-f output from the first mixer is fed into a low impedance winding of the input tuned circuit of FL4. FL4 is a triple-tuned circuit having a nose bandwidth of two megacycles, centered at 38 mc. FL4 output is fed to V3, 6688, which serves as an i-f amplifier. Amplifier output is fed to FL5, another triple-tuned circuit, similar to FL4. The high C/L ratios of FL4 and FL5 tank circuits were chosen to minimize the effects of detuning of these filters due to changes in tube and wiring capacitances, and capacitance changes due to aging. Adjustment of these filters should not be required, and no attempt should be made to "peak" these filters. If inadvertently detuned, realignment with the aid of sweep generator, oscilloscope, marker generator, and detector will be required. The procedure for aligning these filters is given in para. 5.2f., g., and h.

e. I-f Signal Cathode Follower

Output of FL5 is connected to the input of V4A, 6BL8 triode section, operating as a cathode follower. This stage is used to add the 37 to 39 mc i-f output of FL5 to the translated (heterodyned) VFO (XVFO) signal with a minimum of interaction and insertion loss.

f. Second Mixer

V4B, 6BL8 pentode section, mixes the first i-f and XVFO signals and by means of crystal filter FL11 selects the difference frequency of 5.94 mc. The manner in which the incoming signal is translated to 5.94 mc is illustrated in the following example. It was shown in para. c. above how a 10 mc signal in the 10 to 12 mc band is heterodyned to 39 mc. This 39 mc signal is mixed in V4B with the 44.94 mc XVFO signal, the difference being 5.94 mc. If the input signal was 12 mc in the 10 to 12 mc band, the first mixer would heterodyne this to 37 mc. This 37 mc signal would be mixed in the second mixer with an XVFO output signal of 42.94 mc, the difference again being 5.94 mc. The manner in which the XVFO output signal varies between 42.94 and 44.94 mc is described in the following three paragraphs.

g. Variable Frequency Oscillator (VFO)

V14, 6BA6, is connected in a Hartley oscillator circuit. This stable oscillator uses a precision variable capacitor with Invar plates, and a carefully wound oscillator coil, with a ceramic form. The VFO tunes the frequency range 3 to 5 mc, a two megacycle range, corresponding to the two megacycle coverage of each band. When the receiver is tuned to the low end of any band the VFO frequency is 3 mc, and at the high end of each band the VFO frequency is 5 mc. Output from the VFO, taken from a loosely coupled link winding on the oscillator coil, is fed into a low pass filter with cutoff frequency at approximately 5 mc, which then feeds the VFO mixer, V12B.

h. VFO Mixer and Crystal Oscillator

Triode section of a 6U8, V12A, is a crystal oscillator operating at 47.94 mc. Output from this oscillator is added in T5 to the filtered VFO output. (FL10 reduces the harmonic content of the VFO output to prevent spurious signals from appearing in the VFO mixer output.) Pentode section of this 6U8, V12B, mixes the 3 to 5 mc VFO output and the 47.94 mc crystal oscillator signal, and the difference frequency is selected in filter FL8. As the VFO frequency is varied from 3 to 5 mc, the mixer output varies between 44.94 and 42.94 mc.

i. Translated VFO (XVFO) I-f Amplifier

V13, 6EW6, functions as the 42.94 to 44.94 mc i-f amplifier. Output of FL8 feeds this amplifier and the output is passed through FL9 to the second mixer, described in para. f. above.

Filters FL8 and FL9 are wide band filters, similar to FL4 and FL5, and should not require adjustment. Alignment procedure given in para. 5.2i. and j. should be followed in the event these filters are inadvertently tampered with.

j. Third Mixer

V5, 6BE6, operates as a converter, fed by the 5.94 mc output of FL11. A crystal oscillator, consisting of the cathode and grids 1, 2, and 4 of V5, generates a 5.485 mc signal that mixes with the 5.94 mc signal input to grid 3 of this tube and produces a 455 kc i-f output signal. FL11 nose bandwidth is 6 kc and with the BROAD setting of the IF BANDWIDTH switch selected, this filter essentially establishes the maximum receiver i-f bandwidth.

k. 455 Kc I-f Amplifiers

V6 and V7, 6BA6's, are conventional transformer-coupled i-f amplifiers. In the MED. setting of the IF BANDWIDTH switch, a 3.1 kc mechanical filter, FL6, is selected and the receiver i-f bandwidth is determined by this filter. FL7 is selected with the bandwidth switch in the NARROW position. The bandwidth of the mechanical filter plugged into the FL7 socket is specified by the customer.

l. First Audio Amplifier, AVC Rectifier, and Second Detector

6AV6, V8, diode sections are used as AVC rectifier and second detector. AVC delay bias is produced by the drop across the 6AV6 cathode resistor, R59. Detector filter and load resistors, R56 and R61 respectively, return to the cathode and not to ground so that the detector diode, pin 5, is not back-biased by the delay bias.

AVC charge time constant of 0.3 milliseconds permits full AVC bias to be developed in about 1 ms, permitting the use of AVC with CW and SSB signals. Discharge time constant of 0.2 seconds is suitable for use with AM signals; and short enough to permit break-in operation.

Triode section of V8 is a conventional r-c coupled audio amplifier. Input to this amplifier is taken from the diode detector load resistor, R61, or from the output of the product detector, V9B, depending upon the setting of the BFO switch.

m. Product Detector

For reception of signals requiring the use of a BFO, such as CW or SSB, a product detector is used as the second detector. BFO output is injected into the cathode of V9B, 1/2-12AT7. I-f output is coupled from the last i-f transformer, T3, through C75 and C80 to the grid of the product detector.

n. Beat Frequency Oscillator (BFO)

A stable BFO circuit is contained in its own shield can. The conventional Hartley oscillator, using the cathode, grid, and screen of a 6AU6, V16, is temperature compensated with C139, and the output is electron-coupled to the plate circuit L-network consisting of C145 and L36. This network is included to match the low impedance presented by the cathode circuit of the product detector. R-f choke, L21, eliminates hum voltages, either induced in the wiring or due to heater cathode leakage in the product detector. Output of the BFO is sufficient to swing the product detector into the cutoff region for effective mixing.

o. Audio Output Amplifier

A 6BF5, V10, serves as the audio power output amplifier. It furnishes approximately 1 watt of audio output power. Output transformer, T4, provides 4 and 600 ohm outputs. A resistive pad, consisting of R75 and R76 attenuates the 600 ohm, 1 watt output to 1 milliwatt when the 1 mw output is terminated in 600 ohms. Earphones are connected across the 600 ohm, 1 watt output of T4.

When the SPKR. on-OFF switch is in the OFF position, the 4 ohm output of the output transformer is terminated in 10 ohms in order to prevent excessive transient voltages from appearing across the primary.

p. 455 Kc I-f Output Cathode Follower

V9A, 1/2-12AT7, operates as a cathode follower to provide a low impedance output at 455 kc. Follower input is taken from the output of the last i-f transformer, T3, through C75 and R63. Follower output connects to J5, 455 KC OUTPUT jack located on the rear of the receiver chassis.

q. Noise Limiter

A pair of silicon diodes, used to clip positive and negative signals is connected in a self-biasing configuration across the audio gain control. Diodes CR6 and CR7 are biased by the voltage drop across C133 and C134. The drop across these capacitors is in a direction to back-bias their corresponding diodes. When audio signals exceed the bias by 1 volt, the diodes will conduct and clip the audio waveform. The clipper is effective on short or low duty cycle pulses owing to the long time constant of the biasing capacitors and resistor R107. High duty cycle signals, noise or desired, will serve only to increase the bias voltage and thereby raise the voltage at which clipping begins. Optimum signal to noise ratio is achieved by adjusting both the i-f and audio gain controls.

r. 100 Kc Crystal Calibrator

A 6BA6, V15, is connected in a typical Pierce oscillator circuit utilizing a 100 kc crystal for frequency determination. Oscillator signal is electron-coupled to the plate circuit consisting of a 220 K resistor, R101. Although harmonic content of the output is high it is necessary to tune the r-f tuner at the higher frequencies to obtain strong calibrating signals. It is helpful too, when off-the-air signals interfere with calibration at the higher frequencies, to switch in maximum input attenuation. Input attenuation will not reduce the level of the calibrating signal, but will reduce the level of incoming signals.

s. Power Supply

Four M-500 silicon rectifiers, CR8, CR9, CR10, and CR11, are used in a conventional full-wave bridge rectifier circuit. Filtering is provided by L37 and C88B. Power supply output is 145 volts at 245 ma. V17, OB2, provides 108 volts regulated d-c for all voltage-critical circuits.

5.2 SERVICE INSTRUCTIONS

a. General

Instructions in this section deal with adjustments and alignment, and in all instances require test equipment generally not found aboard ship. Attempting to carry out the alignment or adjustments without all of the required test equipment will generally be a wasted effort.

Those service operations which do not require any test equipment or special instructions are given in Section 3.1, Operator's Maintenance.

b. R-f Meter Range Adjustment

Set INPUT ATTEN. at MIN., AVC on, and IF GAIN fully clockwise. At a frequency of 1 mc adjust the level of an unmodulated r-f signal generator for an r-f meter reading of 0 db. Increase generator output by 80 db (10,000 times) and adjust R103 for meter reading of 80 db. Repeat step 3.2d. if zero adjustment is changed. If the RF METER ZERO ADJ. has been reset, it will be necessary to repeat the range adjustment procedure.

c. Audio Meter Calibration

The audio meter is calibrated to indicate 1 mw across 600 ohms when the meter reads 0 dbm. The calibration is made with either the 4 or 600 ohms, 1 watt output terminated in the correct load, and with the 600 ohm, 1 mw output terminated in 600 ohms. Turn the CAL. and BFO on and tune the receiver until a beat note of approximately 1000 cps is obtained. Adjust AUDIO GAIN and IF GAIN controls for 0.775 volts rms across the 600 ohms, 1 mw load. This output voltage corresponds to 1 mw across 600 ohms. Adjust potentiometer R102, AUDIO METER CALIBRATE, for a meter reading of 0 dbm. This control is on the right side of the chassis, to the rear of the VFO.

d. Tests for I-f Misalignment

Before proceeding with alignment of the first i-f (37 to 39 mc) or the XVFO i-f (42.94 to 44.94 mc), the following tests should be performed to determine whether or not both or either of these stages are misaligned:

(1) Overall Wide Band I-f Alignment Test

Set front panel controls as follows:

MC SEL - 2-4 mc
ANT. FILTER - OUT
RF RANGE MC - WB
INPUT ATTEN. - MAX.
IF GAIN - fully clockwise
IF BANDWIDTH - MED.
BFO PITCH - on center panel marker (0)
SPKR. - on
METER, RF-AUDIO - AUDIO
AVC - OFF
ANL - OFF
BFO - on
CAL. - OFF

Disconnect antenna, and set AUDIO GAIN for 0 dbm, with the MAIN TUNING set for 4 mc reception. Tune the receiver to 2 mc noting the change in audio output throughout the entire 2 mc tuning range. If the output level changes by less than ±4 db throughout the range, realignment should not be necessary.

(2) Test For FL8 and FL9 Alignment

Prior to checking alignment of FL8 and FL9 it is necessary to check the VFO output. Two methods of measurement are given. Either a high frequency vacuum tube voltmeter or a 20,000 ohm per volt multimeter is required. If the latter instrument is used, the detector circuit of Fig. 5.1 will be required. Value of C, Fig. 5.1, is 470 mmf.

Connect the r-f VTVM or detector input across R87. Remove second mixer tube, V12, 6U8. With the receiver on, tune the MAIN TUNING from one end of its range to the other. The voltage across R87 should be 0.4 ±0.05 volts rms, as read on the VTVM; or 0.6 ±0.075 volts d-c, as read on the 20,000 ohms per volt multimeter, throughout the entire 2 mc tuning range.

If the VFO output is correct, connect the r-f VTVM or detector input to the junction of R33 and R34. The value of C, Fig. 5.1, is 3 mmf for this measurement. Keep the leads to the VTVM or detector as short as possible. Replace V12. Tune the MAIN TUNING from one end of its range to the other. The voltage at the junction of R33 and R34 should be 0.6 ±0.1 volts rms; or 0.3 ±0.05 volts d-c, as read on the multimeter, throughout the entire 2 mc tuning range.

If the voltage readings are within the limits specified above, alignment of the XVFO i-f filters, FL8 and FL9, is acceptable. If the voltage at the junction of R33 and R34 is low, but constant within the limits specified, the VFO mixer, V12, or XVFO IF AMPLIFIER, V13, 6EW6, is probably at fault.

Low, but constant, output from the VFO would most likely be due to V14, 6BA6. If the VFO output falls off sharply below 5 mc (receiver tuned toward high end of any band) the fault is in the VFO low pass filter, FL10.

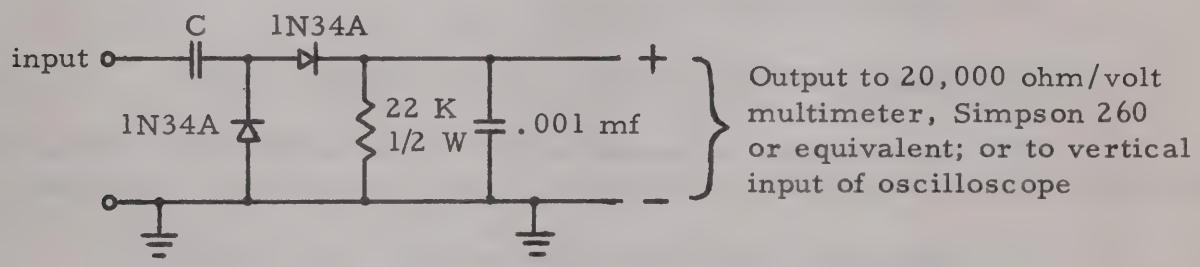


Fig. 5.1 - R-f Detector

e. Notes On Alignment Of FL4, FL5, FL8, And FL9

Before proceeding with the alignment instructions of the following paragraphs, the tests for alignment given in para. d. above should be conducted. If alignment is known to be incorrect, the following alignment instructions should be followed. Test equipment required is as follows:

(1) Oscilloscope	Low or high frequency, with external horizontal sweep input terminals
(2) Sweep Generator	Center frequencies of 15, 38, and 44 mc Sweep width adjustable to approx. 6 mc Output adjustable to a maximum of at least 0.1 volt rms

(3) Marker Generator	Any standard unmodulated signal generator with accurate frequency dial at the frequencies specified in (2) above and within 1 mc of those frequencies Output adjustable to a maximum of at least 0.1 volt rms
(4) R-f Detector	Fig. 5.1, C is 3 mmf

Since these measurements are made at high frequencies and on tuned circuits for which a change of a few mmfs of stray capacitance can cause erroneous tuning, care should be taken in connections of test equipment. Generator and detector lead lengths should be kept extremely short.

f. FL4 Alignment

(1) Select 14 to 16 mc band.

(2) Disconnect blue lead from pin 7 of V3.

(3) Connect 270 ohms, 1/2 watt resistor from pin 7 to pin 9 of V3.

(4) Connect detector input to pin 7 of V3.

(5) Connect detector output to vertical input of scope.

(6) Set scope for approximately 1 volt sensitivity for full screen deflection. (If scope sensitivity is not known, adjust for maximum sensitivity.)

(7) Disconnect green lead from junction of C17 and C18.

(8) Connect sweep generator r-f output to this junction.

(9) Connect marker generator output through 27 mmf to this same junction.

(10) Connect sweep generator sweep output to scope horizontal input. Adjust scope horizontal gain for horizontal line approximately the full width of the screen.

(11) Adjust sweep generator r-f output for approximately 0.1 volt.

(12) Set sweep generator center frequency to 15 mc and adjust sweep width for approximately 4 mc.

(13) Set marker generator to 15 mc and adjust level for a discernable pip on the scope.

(14) Adjust trimmers of FL4 to duplicate pattern shown in Fig. 5.2. Peak to valley ratio should not exceed 3 db.

(15) Reduce level of sweep generator by approximately 6 db. Pattern height should drop to about half if V3 was not overdriven. If V3 was overdriven, repeat alignment at lower level.

(16) Remove 270 ohm resistor and reconnect blue lead to pin 7 of V3.

g. FL5 Alignment

(1) Disconnect green lead from pin 2, V3.

(2) Connect sweep generator r-f output to pin 2, V3.

(3) Connect marker generator output through 27 mmf to pin 2, V3.

(4) Connect detector input to junction of R33 and R34.

(5) Adjust sweep generator and marker generator gains, and connect vertical and horizontal inputs of scope as described in para. f. above.

(6) Set sweep generator center frequency to 38 mc and adjust sweep width for approximately 4 mc.

(7) Set marker generator to 38 mc.

(8) Adjust trimmers of FL5 to duplicate pattern shown in Fig. 5.3. Peak to valley ratio should not exceed 3 db.

h. 37-39 Mc Overall Alignment

(1) Connect and adjust sweep and marker generators as in para. f. above.

(2) Connect detector input to junction of R33 and R34.

(3) Select 14 to 16 mc band.

(4) Overall response should duplicate Fig. 5.4. Retune very slightly if necessary. Peak to valley ratio should not exceed 3 db.

(5) Reconnect green lead to junction C17 and C18.

i. FL9 Alignment

(1) Remove V12.

(2) Disconnect green lead at pin 1, V13.

(3) Connect detector input to junction of R33 and R34.

(4) Connect sweep generator r-f output to pin 1, V13.

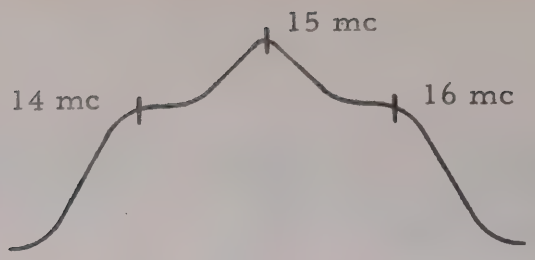


Fig. 5.2 - FL4 Response

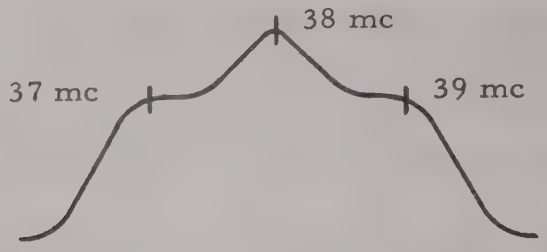


Fig. 5.3 - FL5 Response

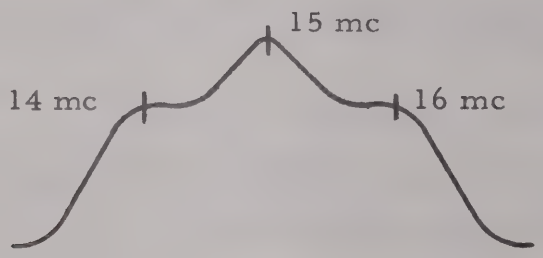


Fig. 5.4 - 37-39 Mc I-f Overall Response

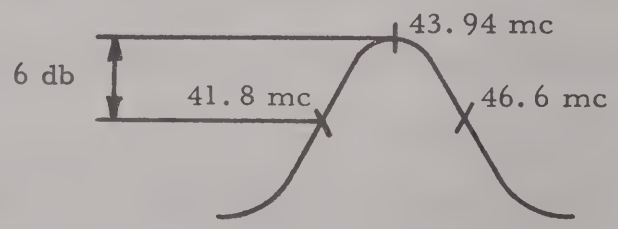


Fig. 5.5 - FL9 Response

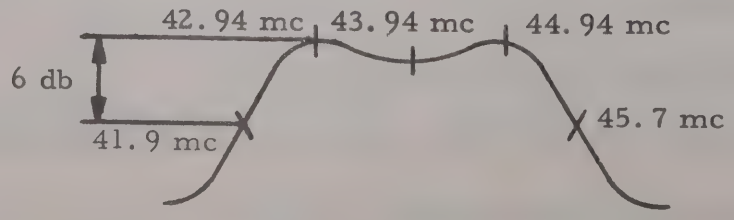


Fig. 5.6 - Overall XVFO I-f Response

(5) Connect marker generator through 27 mmf to pin 1, V13.

(6) Adjust sweep generator and marker generator gains, and connect horizontal and vertical inputs of scope as described in para. f. above.

(7) Set sweep generator center frequency to 44 mc and adjust sweep width for approximately 6 mc.

(8) Set marker generator to 43.94 mc.

(9) Adjust trimmers of FL9 to duplicate pattern shown in Fig. 5.5.

j. FL8 Alignment (And Overall XVFO I-f Alignment)

(1) Reconnect green lead to pin 1, V13. V12 removed.

(2) Connect detector input to junction of R33 and R34.

(3) Connect sweep generator r-f output to junction of R88 and R89.

(4) Connect marker generator through 27 mmf to junction of R88 and R89.

(5) Adjust sweep generator and marker generator gains, and connect horizontal and vertical inputs of scope as described in para. f. above.

(6) Set sweep generator center frequency to 44 mc and adjust sweep width for approximately 5 mc.

(7) Set marker generator to 43.94 mc.

(8) Adjust trimmers of FL8 to duplicate pattern shown in Fig. 5.6. Peak to valley ratio should not exceed 3 db.

(9) Replace V12.

k. 5.94 Mc And 455 Kc I-f Alignment

(1) Connect signal generator, modulated 30% at 400 cps, to junction of R33 and R34.

(2) Set IF BANDWIDTH switch to MED.

(3) AVC - OFF

(4) ANL - OFF

(5) CAL. - OFF

(6) BFO - OFF

(7) AUDIO GAIN - fully clockwise

(8) INPUT ATTEN. - MAX.

(9) Tune generator to 5.94 mc.

(10) Adjust generator level to about 20 uv.

(11) Adjust IF GAIN for AUDIO meter reading of 0 dbm.

(12) Peak the slugs of L39, L40, T2, and T3 for maximum meter reading. Reduce IF GAIN to keep the meter reading at about 0 dbm.

(13) Set IF BANDWIDTH to BROAD and peak L20.

1. VFO Alignment

(1) Equipment Required

(a) R-f generator such as a transmitter, grid dip meter, BC 221, etc., capable of generating approximately 0.1 volts at any of the following frequencies: 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, or 29 mc ±20 kc.

(2) Preliminary Adjustment

(a) Set film drive at 1000 in center of window.

(b) Remove the two 10-32 screws holding the VFO dust cover and dial light assembly.

(c) Disengage the film from the film drive sprocket teeth. Raise the film drive sprocket assembly until it disengages itself from the toothed belt. This will disconnect the VFO tuning knob from the film drive. The frequency of the VFO can now be varied without moving the film dial.

(d) Turn receiver on and allow 15 minutes warm-up.

(e) Disconnect antenna from receiver and connect output of r-f generator to receiver antenna input.

(f) Set MC SEL control to the band in which the frequency chosen for alignment will be in the center.

Example: Frequency of alignment - 7 mc
Band - 6 to 8 mc, etc.

(g) Set: RF RANGE MC - WB
IF GAIN - maximum
AVC - on
BFO - on
AUDIO GAIN - for comfortable listening level
IF BANDWIDTH - BROAD
CAL. - OFF
ANL - OFF

(h) Tune VFO tuning knob until strong beat note is heard in output of receiver. Turn r-f source on and off to make sure beat note is from VFO and r-f source.

(i) The VFO film drive toothed belt can now be re-engaged and tightened.

(j) Remove r-f source from receiver antenna input.

(3) VFO Calibration Adjustments

(a) Receiver controls remain as described in 1.(2)(g) above, except CAL. is turned on. MC SEL on 0-2 mc.

(b) Starting at the center of the film dial with the CURSOR set over the 1000 calibration mark, tune VFO lower in frequency (yellow) noting where the 100 kc beat notes occur as you approach the yellow 000 calibration marks. There should be 10 strong beat notes. The tenth beat note will occur either just before or just after the 000 mark is reached.

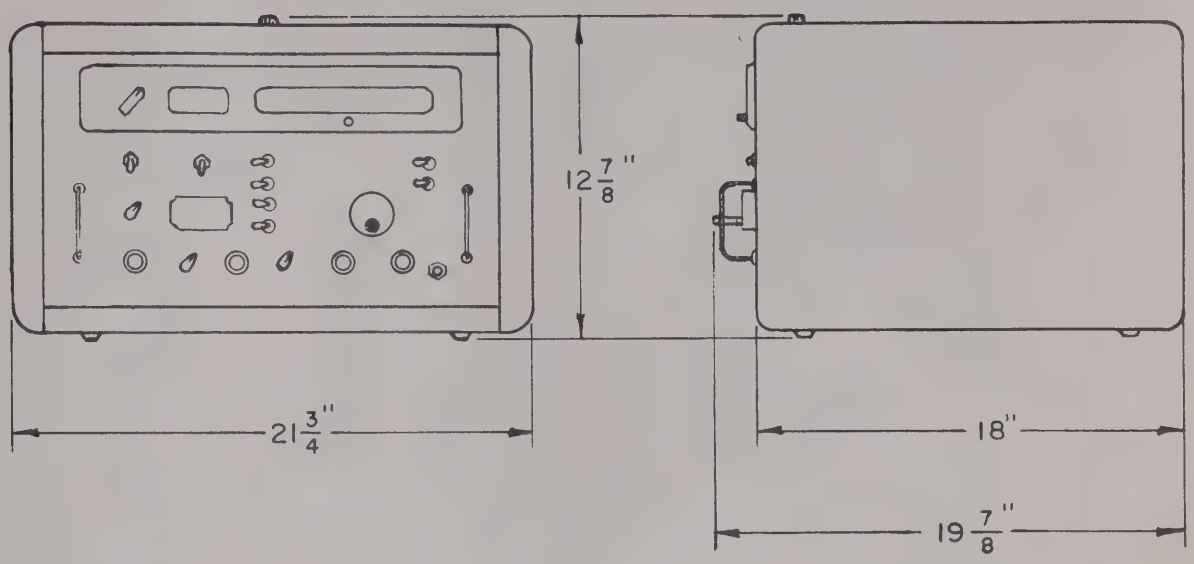
(c) If the tenth beat note occurs just before the 000 mark adjust the tuning slug on the back of the VFO in a clockwise direction until the tenth beat note zeroes at the 000 calibration mark.

(d) If the tenth beat note occurs just after the 000 mark adjust the slug in a counterclockwise direction for the same results.

(e) Now starting from the 000 mark in the yellow, tune VFO towards high frequency end of tape (green) counting beat notes as you go. In this case, there will be 20 of them by the time the 000 mark on the green end is reached.

(f) The same procedure is now followed to make the twentieth beat note coincide with the 000 mark on the green. This adjustment is made, however, with the trimmer capacitor screw located on the left side of the VFO.

(g) Repeat steps (c), (d), (e), and (f) until no further adjustment is necessary to have the beat notes occur at each end. This completes the alignment procedure.

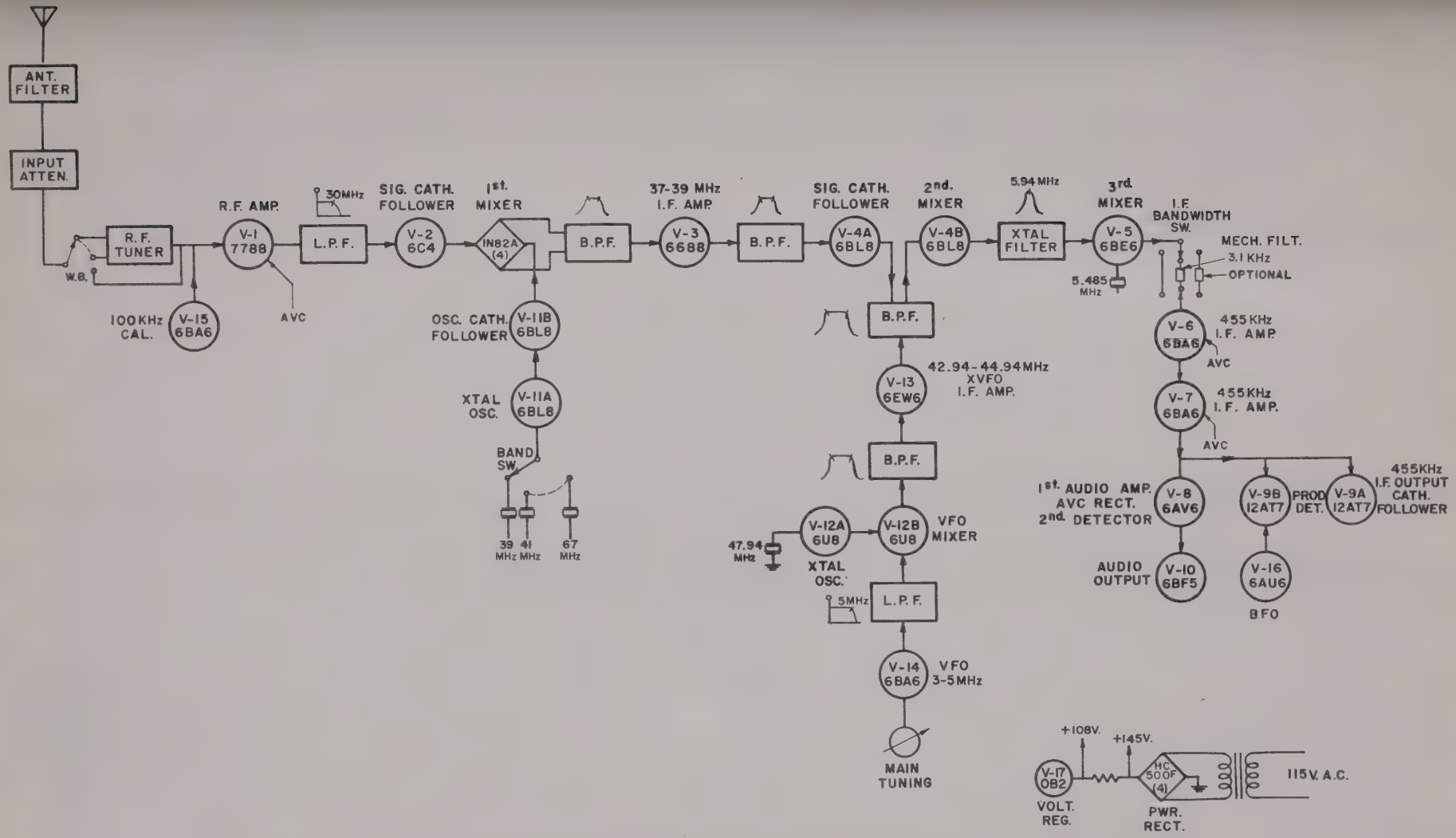


WEIGHT = 70LBS.

MACKAY RADIO & TELEGRAPH CO.
MARINE DIVISION
CLARK, NEW JERSEY

OUTLINE
3010 RECEIVER

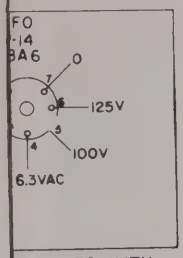
SCALE				
APP'D.	ENG.	CHK'D.	DRAWN	M-7577-1A
			M$D	



MACKAY RADIO & TELEGRAPH CO.
MARINE DIVISION
CLARK, NEW JERSEY

3010-C RECEIVER BLOCK DIAGRAM

SCALE	APP'D.	ENG.	CH'K'D.	DRAWN	M-7645-12B
		AF	AF	M&D	



OF VFO WITH
M (OR EQUAL)
SOCKET ADAPTER

SPECT TO THE CHASSIS AND ARE
OHM PER VOLT MULTIMETER SUCH

ET AS FOLLOWS:

.B.
AX
LOCKWISE
ENTER PANEL MARKER (0)
SETTING

NY SETTING
,- R.F.

H R.F. CHOKE

MACKAY RADIO & TELEGRAPH CO.
MARINE DIVISION
CLARK NEW JERSEY

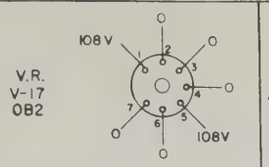
TUBE SOCKET VOLTAGES
3010 B RECEIVER

SCALE

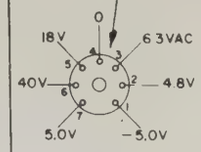
APP'D	ENG	DRAWN
	AF	A.G.

M-7650 -14A

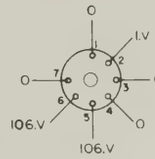
TOP VIEW — CALIBRATOR WITH VECTOR T7M (OR EQUAL) 7 PIN TEST SOCKET ADAPTER, MEASURED WITH CALIBRATOR ON.



V.R.
V-17
0B2

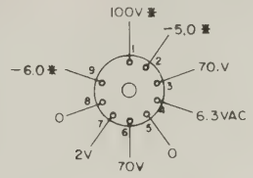


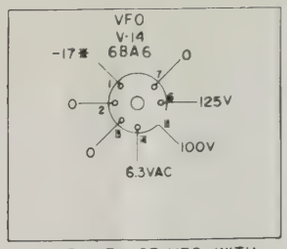
100 KC
CALIBRATOR
V-15
6BA6



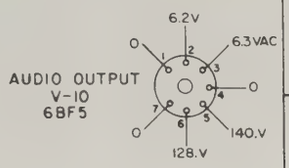
XVFO IF
AMP
V-13
6EW6

CRYSTAL OSCILLATOR
AND VFO MIXER
V-12
6U8

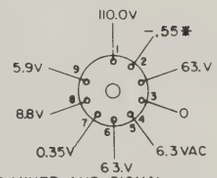




REAR VIEW OF VFO WITH
VECTOR T7M (OR EQUAL)
7 PIN TEST SOCKET ADAPTER

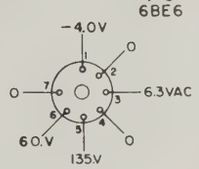


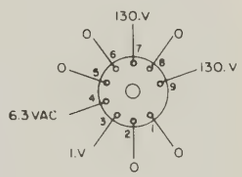
AUDIO OUTPUT
V-10
6BF5



2ND MIXER AND SIGNAL
CATHODE FOLLOWER
V-4 6BL8

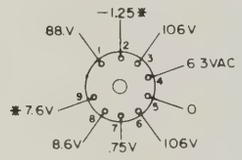
3RD MIXER
V-5
6BE6

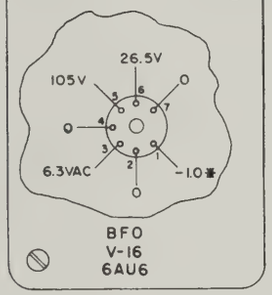




37-39MC
IF AMP
V-3
6688

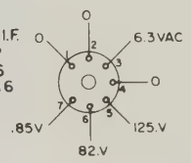
CRYSTAL OSCILLATOR
AND CATHODE FOLLOWER
V-11
6BL8

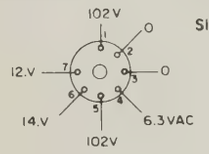




BFO
V-16
6AU6

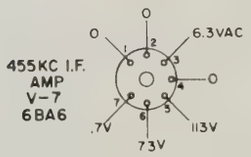
455KC I.F.
AMP
V-6
6BA6



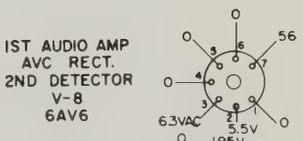


SIGNAL CATHODE
FOLLOWER
V-2
6C4

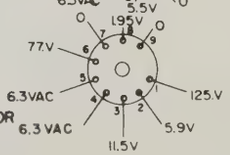
455KC I.F.
AMP
V-7
6BA6

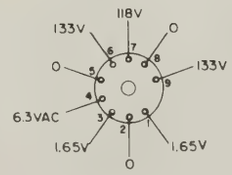


IST AUDIO AMP
AVC RECT.
2ND DETECTOR
V-8
6AV6



455KC I.F. OUTPUT
CATHODE FOLLOWER
AND PRODUCT DETECTOR
V-9
12AT7





R.F. AMP
V-1
7788

NOTES:

1. ALL READINGS ARE WITH RESPECT TO THE CHASSIS AND ARE MEASURED WITH A 20,000 OHM PER VOLT MULTIMETER SUCH AS THE SIMPSON 260.
2. FRONT PANEL CONTROLS SET AS FOLLOWS:

MC SEL., 0-2 MC
ANT. FILTER, OUT
RF RANGE MC-W.B.
INPUT ATTEN. - MAX
IF GAIN, - FULLY CLOCKWISE
BFO PITCH, - ON CENTER PANEL MARKER (0)
AUDIO GAIN, - ANY SETTING
SPKR, ON
STBY. - REC., - REC.
MAIN TUNING. - ANY SETTING
METER, R.F. - AUDIO, - R.F.
AVC, OFF
ANL, OFF
BFO, ON
CAL., OFF

* MEASURED THROUGH 2.5MH R.F. CHOKE

BOTTOM VIEW

MACKAY RADIO & TELEGRAPH CO.
MARINE DIVISION
CLARK NEW JERSEY

TUBE SOCKET VOLTAGES
3010 B RECEIVER

SCALE ~

APP'D	ENG	DRAWN	M-7650 -14A
	AF	A.G.	

RECEIVER ANTENNA AND KEYING RELAY TYPE MR-599-5

Description
Electrical Parts List, M-8768-1
List of Spare Parts, M-8771-1
Schematic, M-8767-1

RECEIVER ANTENNA AND KEYING RELAY TYPE MR-599-5

The purpose of the MR-599-5 Receiver Antenna and Keying Relay is to remove the receiving antenna from a receiver when the transmitter is operating, thus preventing r-f voltages which might be picked up by the receiving antenna from damaging the input circuit of the receiver. This unit also provides a set of contacts that are intended to be used to key the transmitter. This arrangement insures that the receiver antenna is disconnected before the transmitter comes on. The relay is capable of keying the transmitter at 50 words per minute and allows break-in operation.

Referring to the schematic, the circuit description of the keying relay is as follows: T1, D1, C1, and R1 comprise a half wave, high impedance power supply whose unloaded output voltage is -20 volts with respect to ground. One coil terminal of the 6 volt relay, K1, is connected to the output of this -20 volt supply and the other coil terminal is connected to terminal 4 of TB1. The hand key is connected to terminal 4 of TB1 and ground. When the key is closed, the current produced by the -20 volt supply causes K1 to pull in very quickly. R1 limits the voltage across the relay coil to 8 volts. The normally open contacts of K1 which are connected to terminals 6 and 7 of TB1 normally replace the telegraph key. The second set of contacts remove the receiving antenna (P1) from the receiver's antenna input (P2) and connect the receiving antenna to ground. When the hand key is opened, K1 is de-energized and the above process is reversed. The pull in time and drop out time is approximately 5 milliseconds.

When the MR-599-5 Receiver Antenna and Keying Relay is used in an installation with an MR-101-6B/C Radiotelephone Adapter, terminal 3 of TB1 is connected to the blocking bias of the h-f transmitter. This blocking bias voltage (-135 V) is connected through a reversed diode, D2, to the coil of K1 and has no effect upon the relay. However, when the blocking bias voltage is short circuited by the keying contacts (B of relay K3 in the Radiotelephone Adapter), the -20 volt power supply will conduct through D2 and energize K1.

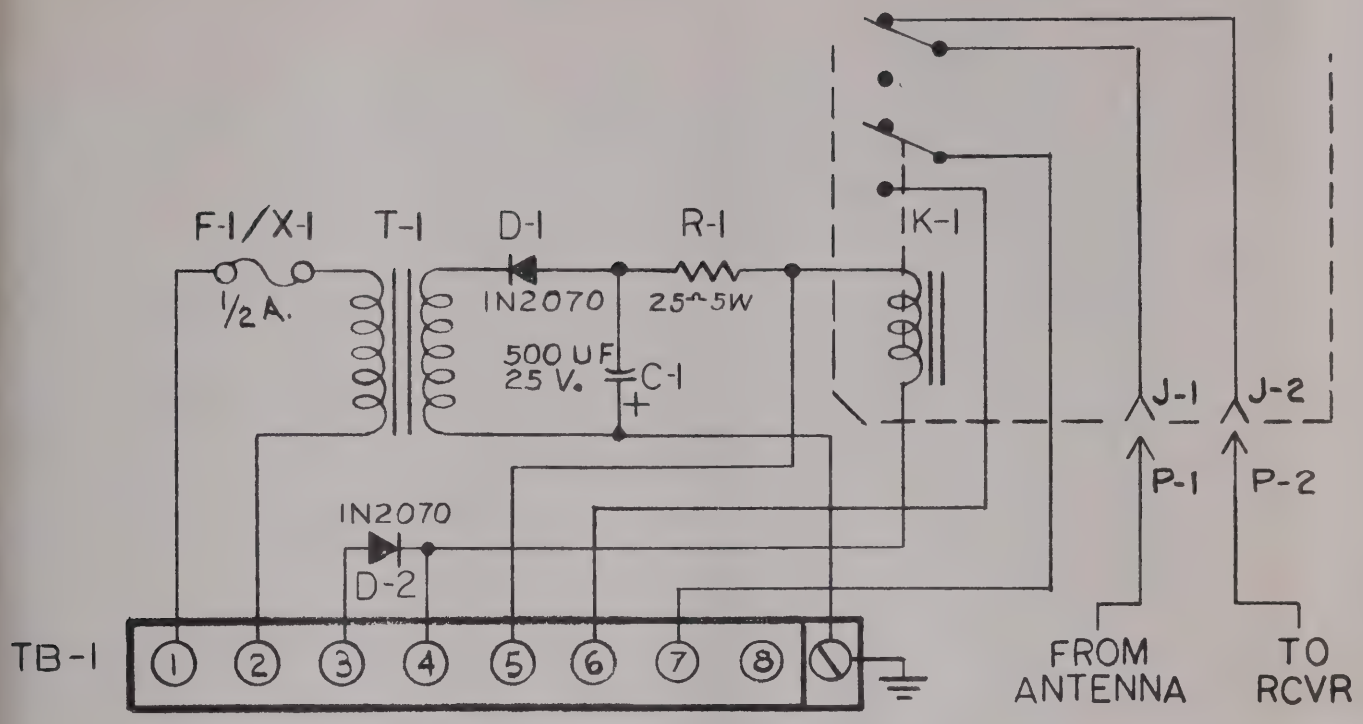
Another relay similar to K1 can be used to key the antenna of another receiver by connecting its coil terminals to terminals 4 and 5 of TB1.

ELECTRICAL PARTS LIST
FOR
RECEIVER ANTENNA AND KEYING RELAY TYPE MR-599-5
M-8768-1

Stock No.	Symbol	Description	Dwg. /Cat. No.
276-94	C1	Capacitor, electrolytic, 500 mf, 25 VDCW	Cornell Dubilier BR500-25
709-2	D1 D2	Diode, silicon, 400 PIV, 750 ma	Texas Inst. 1N2070
353-3	F1	Fuse, cartridge, 1/2 amp, 250 V	Bussmann AGC-1/2
572-10	J1 J2	Receptacle, chassis, UHF	Amphenol 83-1R
578-11	K1	Relay, 6 VDC coil, DPDT	Kurman 262C6DC
550-37	P1 P2	Plug, for RG-59/U cable	Amphenol 83-750
658-13	R1	Resistor, 25 Ω, 5 W	Clarostat VPR-5F
803-28	T1	Transformer, 115 V pri., 12.6 V sec.	Freed TF19
796-102	TB1	Terminal board, 8 terminals, with marker strip	Cinch Jones 8-140 with MS8-140
395-4	X1	Fuseholder	Bussmann HKP

LIST OF SPARE PARTS
FOR
RECEIVER ANTENNA AND KEYING RELAY TYPE MR-599-5
M-8771-1

Qty.	Stock No.	Description
5	353-3	Fuse, cartridge, 1/2 amp, 250 V, Bussmann AGC-1/2



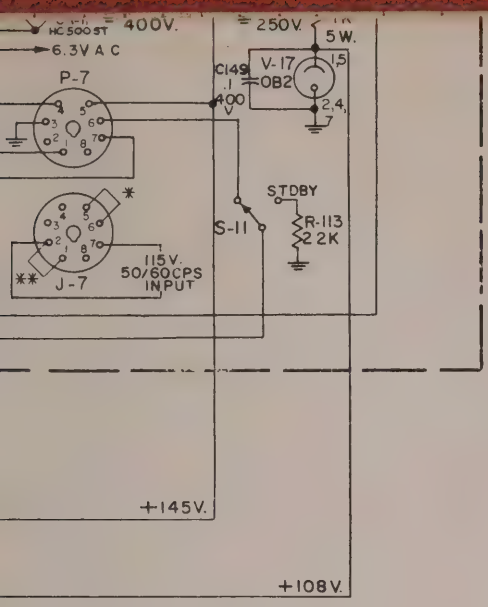
MACKAY RADIO & TELEGRAPH CO.
MARINE DIVISION
CLARK, NEW JERSEY

RECEIVER ANTENNA & KEYING RELAY

SCALE ~				
APP'D.	ENG.	CHK'D.	DRAWN	M-8767-1B
			M§D	

RECORD OF FIELD MODIFICATIONS

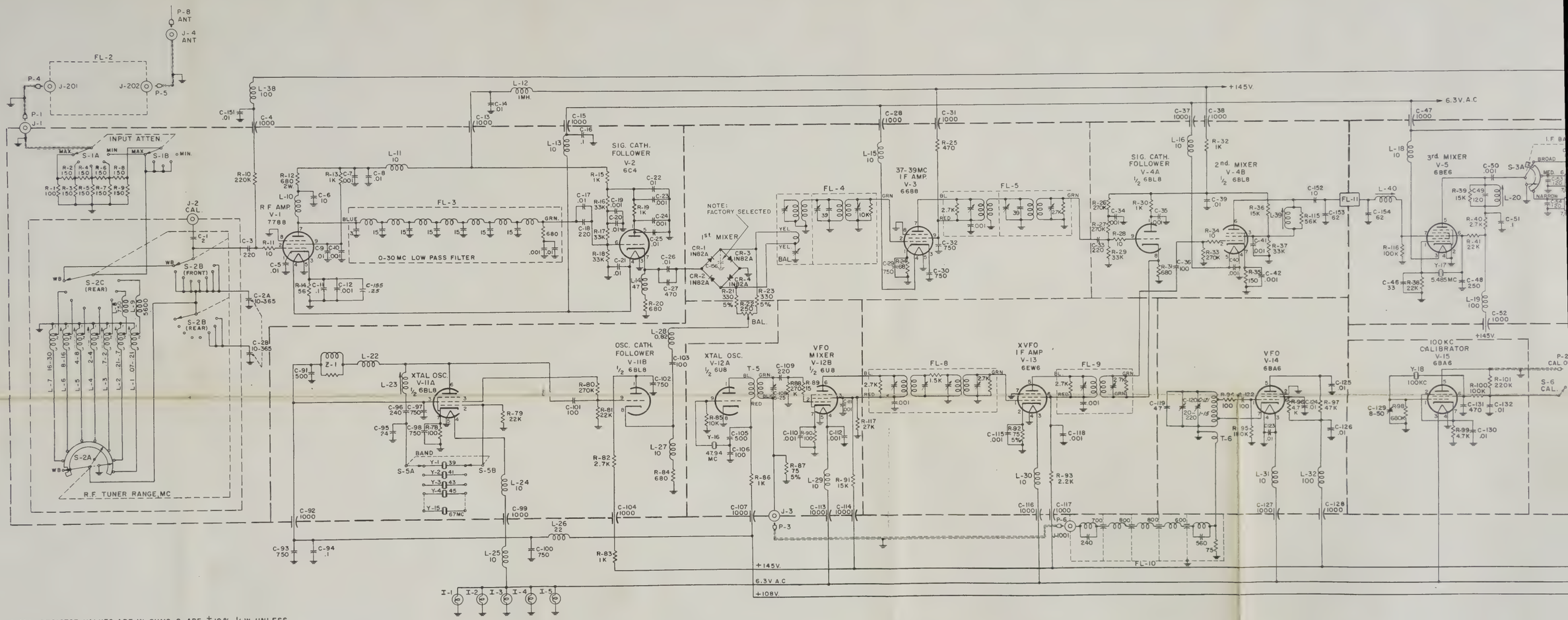
Equipment Type			Serial No.
Service Bulletin Number	Made By	Date	Remarks



* REMOVE JUMPER & CONNECT REMOTE STDBY. SW. TO PINS 5 & 6 IF DESIRED.

** REMOVE JUMPER & CONNECT REMOTE AC PWR. SW. TO PINS 1 & 2 IF DESIRED.

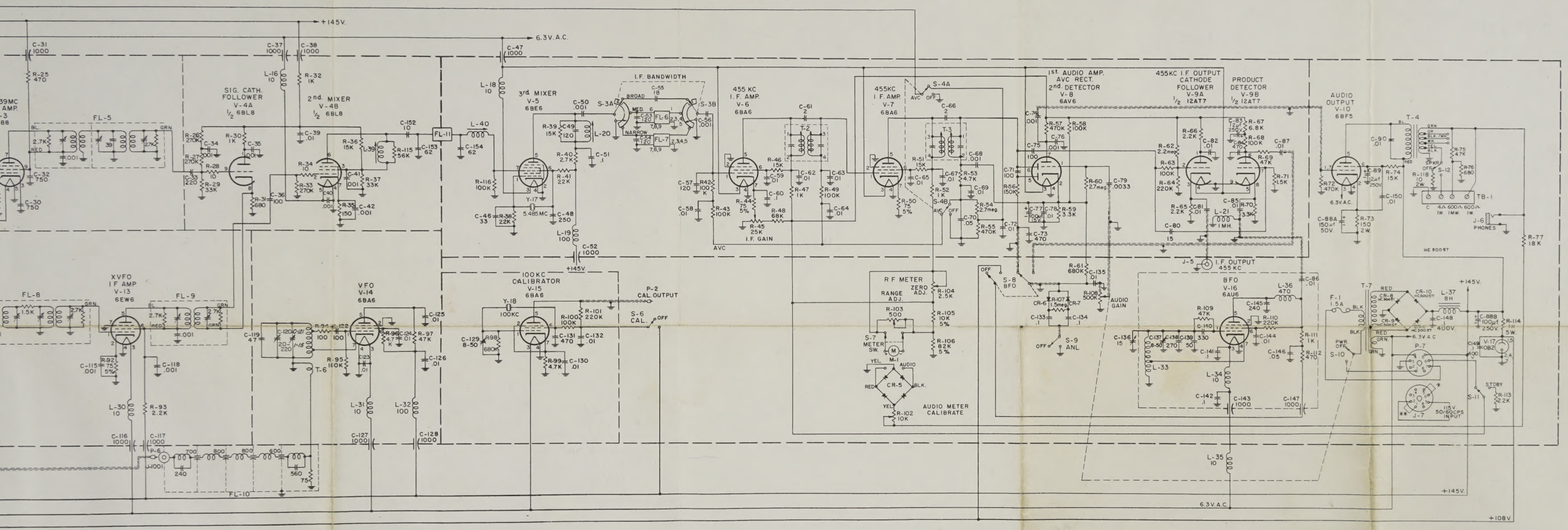
USED WITH	ASSEMBLY DWG.	MACKAY RADIO & TELEGRAPH CO. MARINE DIVISION CLARK, NEW JERSEY
ELECT. PARTS LIST	M-7501-1	SCHEMATIC 3010 RECEIVER
		SCALE — APP'D. — ENG. — CHK'D. — DRAWN MJD — M-7500-15 H



1. ALL RESISTOR VALUES ARE IN OHMS & ARE ±10%, 1/2 W. UNLESS OTHERWISE NOTED.

2. ALL CAPACITOR VALUES 1 & OVER ARE IN μμf. & ALL VALUES UNDER 1 ARE IN uf. UNLESS OTHERWISE NOTED.

3. ALL INDUCTOR VALUES ARE IN μh. UNLESS OTHERWISE NOTED.



USED WITH	ASSEMBLY DWG
ELECT. PARTS LIST	M-7501-1

MACKAY RADIO & TELEGRAPH CO.
MARINE DIVISION
CLARK, NEW JERSEY

SCHEMATIC 3010 RECEIVER

SCALE	APP'D.	ENG.	CHK'D.	DRAWN
				MJD

M-7500-15H